Volume 10
Number 1
2000

NOVON

Status and Relationships of the Chinese Endemic *Platycraspedum* (Brassicaceae)

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ABSTRACT. The generic limits and relationships of *Platycraspedum* are discussed, and the new species *P. wuchengyii* is described. It is most closely related to *Taphrospermum*, from which it differs by having toothed filaments of median stamens, 2-lobed stigmas, palmately veined leaves, unequal sepals, and minutely reticulate seeds.

As delimited here, *Platycraspedum* O. E. Schulz consists of two Chinese species endemic to eastern Xizang (Tibet) and neighboring Sichuan. Schulz (1922) compared the generic type, *P. tibeticum*, with *Dilophia* Thomson and later (Schulz, 1936) placed both genera in the tribe Lepidieae. However, *Platycraspedum* does not have angustiseptate fruits, a feature Schulz (1936) used primarily to define the limits of Lepidieae. In our opinion, *Platycraspedum*, along with *Dilophia*, *Taphrospermum* C. A. Meyer, *Lignariella* Baehni, and several other genera, should be closely associated with *Cardamine* L., all of which share flattened replums, a feature very rare elsewhere in the Brassicaceae. The present paper does not aim to present the tribal alignments of these genera; nonetheless Schulz's (1936) placement of *Platycraspedum* in the Lepidieae is unwarranted.

Platycraspedum is most closely related to *Taphrospermum*, a genus of seven species (Al-Shehbaz, unpublished) distributed primarily in China. Both genera have fleshy fusiform roots, a whorl of scale-like leaves at the root base, petiolate cauline leaves, bracteate inflorescences, white petals, basally dilated median filaments, and flattened replums. *Platycraspedum* is readily separated from *Taphrospermum* by its palmately veined cauline leaves and bracts, minutely reticulate seeds, strongly flattened and toothed median staminal filaments, unequal sepals with the lateral pair saccate, poorly developed lateral nectaries with the median ones lacking, and 2-lobed stigmas. By contrast, *Taphrospermum* has pinnately veined cauline leaves and bracts, foveolate or rarely papillate seeds, terete and toothless filaments, equal and nonsaccate sepals, well-developed annular lateral nectaries confluent with median ones, and entire stigmas.

Platycraspedum can easily be confused with some species of *Eutrema* R. Brown sect. *Wasabia* (Matsumura) O. E. Schulz, but it can be separated by its strongly flattened and 1-toothed median filaments, flattened replums, non-mucronate leaf teeth, subsessile fruits, unequal sepals with the inner pair saccate, 2-lobed stigmas, and lack of septa. *Eutrema* has slender and toothless median filaments, terete replums, mucronate teeth or leaf-vein endings, stipitate fruits, equal sepals with the inner

pair nonsaccate, entire stigma, and complete septum.

Although the two species of *Platycraspedum* are quite different in fruit morphology (see key), we believe that their shared characters (fleshy taproots, fully bracteate inflorescences, petiolate, palmately veined cauline leaves, non-mucronate leaf marginal teeth, white flowers, unequal sepals with inner pair saccate, flattened and toothed median filaments, 2-lobed stigmas, flattened replums, absence of septa, and accumbent flattened seeds) provide ample evidence to treat them as congeneric.

Platycraspedum O. E. Schulz, Repert. Sp. Nov. Regni Veg. Beih. 12: 386. 1922. TYPE: *Platycraspedum tibeticum* O. E. Schulz.

Herbs biennial or perennial. Trichomes simple. Roots fusiform, fleshy. Stems erect, short, and simple at base, with several, long, decumbent to ascending branches. Basal leaves absent. Cauline leaves petiolate, repand-dentate to palmately lobed, the lobes not mucronate, base cordate. Racemes several-flowered, terminal, corymbose, bracteate throughout, elongated considerably in fruit. Sepals oblong (outer pair) or broadly ovate (inner), deciduous, glabrous, unequal, base of inner pair saccate, margins membranous. Petals white, narrowly obovate to subelliptic. Stamens 6, tetradynamous; filaments white; median pair strongly flattened, laterally 1-toothed; anthers oblong. Nectar glands 2, annular, lateral; median nectaries absent. Ovules 3 to 9 per ovary. Fruit dehiscent siliques, linear to oblong, terete or 4-angled, short stipitate; valves obscurely veined or with a prominent, narrowly winged midvein, keeled or not keeled; gynophore short and rarely to 1 mm long; replum flattened, winged or wingless; septum absent; style to 1.5 mm long; stigma 2-lobed. Seeds uniseriate, wingless, oblong to ovate, flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

KEY TO THE SPECIES OF *PLATYCRASPEDUM*

1a. Fruit 4-angled, narrowly 4-winged, not torulose, 2.5–3 mm wide; petals 4–6 × 2–3 mm; seeds (2.8–)3–3.5 mm long . . . . . 1. *P. tibeticum*
1b. Fruit terete, wingless, torulose, ca. 1.5 mm wide; petals 3–4 × 1–1.5 mm; seeds 2–2.5 mm long . . . . . 2. *P. wuchengyii*

1. Platycraspedum tibeticum O. E. Schulz, Repert. Sp. Nov. Regni Veg. Beih. 12: 386. 1922. TYPE: China. Sichuan [as Tibet]: Tatsienlu, zwischen den Steinen des Mani auf der Passhöhe Gila, 4400 m, 4 Oct. 1914, *W. Limpricht 1838* (lectotype, here designated, WRSL; isolectotype, WU).

Herbs (6–)10–20(–60) cm tall, glabrous or sparsely pubescent with trichomes to 0.8 mm long. Root fusiform, to 5 mm diam. Stem several-branched from single short base. Cauline leaves petiolate, glabrous or pubescent; petiole (0.1–)0.5–2(–3) cm long; leaf blade suborbicular to cordate or broadly ovate, (4–)7–15 × (1–)5–12(–15) mm, reduced in size in inflorescence, base cordate, margin repand-dentate to repand or palmately 5-lobed, the teeth or lobes not mucronate, apex obtuse. Sepals 1.5–2 × 0.8–1.5 mm, glabrous, margin membranous and to 0.2 mm wide; outer pair oblong, narrower than inner, not saccate at base; inner pair broadly ovate, saccate at base. Petals white, narrowly obovate to subelliptic, 4–6 × 2–3 mm, base cuneate, apex rounded. Filaments white, 1.1–2 mm long; outer pair slender; inner pair strongly flattened basally and 0.4–0.6 mm wide, with ovate to oblong lateral tooth 0.2–0.4 × 0.1–0.2 mm; anthers oblong, 0.4–0.6 mm long, apex obtuse. Ovary 6- to 9-ovuled. Fruiting pedicel slender, ascending to divaricate, straight to recurved, (3–)5–12(–20) mm long. Fruit narrowly oblong, 4-angled and longitudinally 4-winged, curved, not torulose, (6–)8–15 × 2.5–3 mm, base cuneate; valves glabrous, with a well-developed, winged midvein with wing to 0.5 mm wide; replum longitudinally winged with a wing to 0.5 mm; style thick, 0.5–1.5 mm; gynophore to 0.5 mm. Seeds ovate to broadly oblong, flattened, (2.8–)3–3.5 × 1.5–2 mm. Flowering June–August, fruiting July–September.

Alpine areas at 4100–4800 m.

Specimens examined. CHINA. **Sichuan:** Kanting (Tachienlu), Cheto, La, *Harry Smith 11042* (MO, S, UPS); Tatsien-lu, *Cunningham 124* (E); Tatsienlu (listed as Tibet), unter Gebüsch am Abstieg vom Passe Gila nach dem Haus Tajiatsuka, 4100 m, *Limpricht 1667* (WRSL, WU); Dawo, Felsgrate des Ressirrma oberhalb des Passes Ssirka westlich Tschlisse tsung, 4840 m, *Limpricht 1931* (WRSL). **Xizang (Tibet):** Batang, Yargong, *Soulié 3088* (P); Tongolo, Kiala, *Soulié 1024* (P).

Although *Platycraspedum tibeticum* was based on three syntypes, all of which were allegedly collected from eastern Tibet (Xizang), their actual localities are in Sichuan, and perhaps for that reason the species was not included in the *Flora of Xizang* (Kuan, 1985). However, as cited above, the species does occur in Xizang. Of the three syntypes cited by Schulz (1922), *Limpricht 1838* has flowers and fruits and is herein designated as the lectotype.

The illustration of *Platycraspedum tibeticum* in Kuan (1987) is inaccurate in the number of marginal leaf teeth, as the species was shown to have up to eight marginal teeth when in fact the maximum it has is four. Furthermore, Ying et al. (1993)

incorrectly described the lateral stamens as toothed and the median ones as linear, and the reverse is correct.

2. Platycraspedum wuchengyii Al-Shehbaz, T. Y. Cheo, L. L. Lu & G. Yang, sp. nov. TYPE: China. Xizang: Mangkang Xian, wet grounds by river, 4000 m, 27 June 1976, *Qinghai-Xizang Expedition 12038* (holotype, KUN; isotype, PE).

Herba 5–25 cm alta. Radix fusiformis carnosa. Folia caulina petiolata, suborbiculata, cordata, vel subreniformia. Petala alba, subelliptica vel anguste oblonga, 3–4 × 1–1.5 mm. Filamenta mediana complanata, unidentata. Fructus lineares, teretes, torulosi, nonalati, 6–15 × ca. 1.5 mm. Semina oblonga, compressa, 2–2.5 × ca. 1.5 mm.

Herbs 5–25 cm tall, glabrous or sparsely pubescent with trichomes to 1 mm long. Root fusiform, fleshy, to 2 mm diam. Stem single at base, with few to several, slender, ascending to decumbent branches. Cauline leaves petiolate, glabrous or very sparsely pubescent; petiole 0.5–2.5(–4) cm long; leaf blade suborbicular to cordate or subreniform, 4–12 × 5–15 mm, reduced in size in inflorescence, base cordate, margin repand to shallowly and obtusely palmately 5-lobed, the lobes not mucronate, apex obtuse. Sepals 1–1.5 × 0.6–1 mm, glabrous, margins membranous and to 0.1 mm wide. Petals white, narrowly subelliptic to narrowly oblong, 3–4 × 1–1.5 mm, base cuneate, apex rounded. Filaments white, 1.1–1.5 mm long; outer pair slender; inner pair strongly flattened basally and 0.3–0.5 mm wide, with ovate to oblong lateral tooth to 0.2 × 0.1 mm; anthers oblong, 0.3–0.4 mm long, apex obtuse. Ovary 3- to 6-ovuled. Fruiting pedicel slender, ascending to divaricate, straight, 5–15 mm long. Fruit linear, terete, wingless, torulose, 6–15 × ca. 1.5 mm, base cuneate; valves sparsely and minutely puberulent, obscurely veined, wingless; replum wingless; style thick, 0.5–1.5 mm; gynophore to 1 mm. Seeds oblong, flattened, 2–2.5 × ca. 1.5 mm. Flowering June–August, fruiting July–August.

Wet grounds by rivers, slopes of ravines in *Juniperus* forests, and woods at 4000–4500 m.

Paratypes. CHINA. **Sichuan:** Upper Yalong basin, Chola Shan, Dege-Garze, Manigango, 31°52′N, 99°07′E, *G. & S. Miehe & Wündisch 94-433-22* (GOET); Deige Xian, Babang Xiang, *Anonymous 7389* (PE #1137899).

Platycraspedum wuchengyii is named in honor of Wu Zhengyi (Wu Chengyi), Director Emeritus of the Kunming Institute of Botany, Editor-in-Chief of the Chinese *Flora Reipublicae Popularis Sinicae*, and Co-chair of the *Flora of China*, in recognition of his outstanding contributions to the flora of China. Professor Wu annotated the holotype of *P. wuchengyii* as *P. tibeticum*.

Two collections, the type and *Anonymous 7389* (PE #1137899), were cited by Wang (1993) as *Platycraspedum tibeticum*. It appears that the remarkable differences in the fruits of the two species (see key) were overlooked.

Acknowledgments. We are grateful to Qin Haining (PE), Sun Hang (KUN), Pete Lowry (MO at P), and W. Till (WU) for their help during visits to their herbaria. Zhu Guanghua and Song Hong are thanked for translating Chinese text and herbarium labels. We thank G. Dickoré and G. and S. Miehe (GOET) for sending to the senior author many Chinese collections for determination.

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Carica palandensis (Caricaceae), a New Species from Ecuador

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ABSTRACT. A new species of the genus *Carica*, found in forests in southeast Ecuador, is described. *Carica palandensis* Badillo, Van den Eynden & Van Damme is clearly distinguished from all other *Carica* species by its always compound leaves with 5- to 9-petiolulate leaflets.

RESUMEN. Se describe una nueva especie del género *Carica* encontrada en los bosques del sureste del Ecuador. *Carica palandensis* Badillo, Van den Eynden & Van Damme se distingue claramente de las demás especies de *Carica* por sus hojas siempre compuestas con 5 a 9 folíolos petiolulados.

In the course of an ethnobotanical inventory of wild edible plants in southern Ecuador, a new species of *Carica* was collected in Palanda in the Amazonian province of Zamora-Chinchipe. After the initial collection of a female plant in December 1995, a second visit was paid to the same area in June 1997, and as a result more material was collected of both male and female plants. The area where this species was discovered is under great pressure from land clearance for timber production, to the extent that the site of the December 1995 collection was completely cleared by June 1997 and the species no longer existed at this site.

Carica palandensis Badillo, Van den Eynden & Van Damme, sp. nov. TYPE: Ecuador. Prov. Zamora-Chinchipe: Palanda, barrio Agua Dulce, sector Los Cedros, 1850 m, 4°41′03″S, 79°10′16″W, 8 June 1997, *V. Van den Eynden, E. Cueva & O. Cabrera 998* (holotype, QCA; isotypes, LOJA, MY, QCNE). Figure 1.

Arbor trunco recto simplici usque ad 10 cm diametro et 6 m alto. Folia digitata 5 ad 9-foliolata; foliolis acuminatis petiolulatis, supra glabris, infra secus nervos puberulis, lateralibus 8–42.5 cm longis et 3.5–13.5 cm latis, integris, centrali conspicue trilobato, lobis lateralibus 14–29 cm longis, 4.5–8 cm latis, centrali pseudopetiolulato, 20–36 cm longo, 7.5–12 cm lato. Inflorescentia staminata axillaris, anguste paniculata multiflora, puberula, usque ad 16 cm longa, floribus breviter pedicellatis. Flos staminatus sepalis triangulis 1–2 mm longis, 0.5–1 mm latis; corolla flava, tubo 15–22 mm longo, 1.5–4 mm lato, lobulis oblongo-lanceolatis 15–21 mm longis, 2–4 mm latis; staminibus 10 biseriatis, 5 superiorum antheris glabris, 2–2.5 mm longis, filamentis 2–2.5 mm longis, breviter et laxe pilosis, 5 inferiorum antheris glabris, 2–2.5 mm longis, connectivo 1 mm, filamentis 1 mm longis. Inflorescentia pistillata axillaris, pauciflora, flores terminalem unicum et laterales nonnullos pedicellatos gerente, usque ad 9 cm longa, leviter pubescens. Flos pistillatus sepalis triangulis, 2–3 mm longis, 1.5–2 mm latis; petalis flavis puberulis, oblonge triangulis, 45–60 mm longis, 9–12 mm latis; ovario supero, 5-loculari, 5-angulari, 11–19 mm longo, 7–13 mm lato, apicem versus attenuato; ovulis numerosis placentatione parietali; stylo 3–4.5 mm longo; stigmatibus 5, 7–10 mm longis, puberulis, apicem versus bifidis, ramulis 2–3 mm longis. Fructus baccatus luteus subglobosus, 7–8.5 cm longus et 6.4–8 cm latus, pedicello 9.5–11 cm longo insidens; seminibus ellipsoideis 7–8 mm longis et 4–5 mm latis, in greges quinque pulpa aurantiaca circumcinctas aggregatis, unoquoque semine sclerostesta tuberculis conicis ornata praedito et sarcotesta gelatinosa circumcincta.

Dioecious tree to 6 m tall; DBH 5–10 cm; bark light brown, covered with leaf scars; stipules absent. Latex opaque milky. Leaves membranacous, alternate, crowded at top of tree, palmately compound; petiole to 64 cm long; petiolules 6–25 mm long; leaflets 5 to 9 (5 to 7 on male plants, 5 to 9 on female plants), glabrous and bright green above, lighter green below with short slight pubescence on veins; 4 to 8 basal leaflets entire, 8–42.5 × 3.5–13.5 cm, narrowly elliptic to narrowly ovate, base acute, apex acuminate; central leaflet trilobed, 2 lateral lobes 14–29 × 4.5–8 cm, elliptic, apex acuminate, central lobe appearing to be a petiolulate leaflet but actually subtended by an extension of the main vein, 20–36 × 7.5–12 cm, elliptic to ovate, base acute, apex acuminate; veins raised beneath, primary vein often reddish. Male inflorescences axillary, many-flowered panicles, to 16 cm long, pubescent; peduncle 3–9 cm long, to 2 mm diam.; lateral branches 1–5 cm long; pedicels 2–6

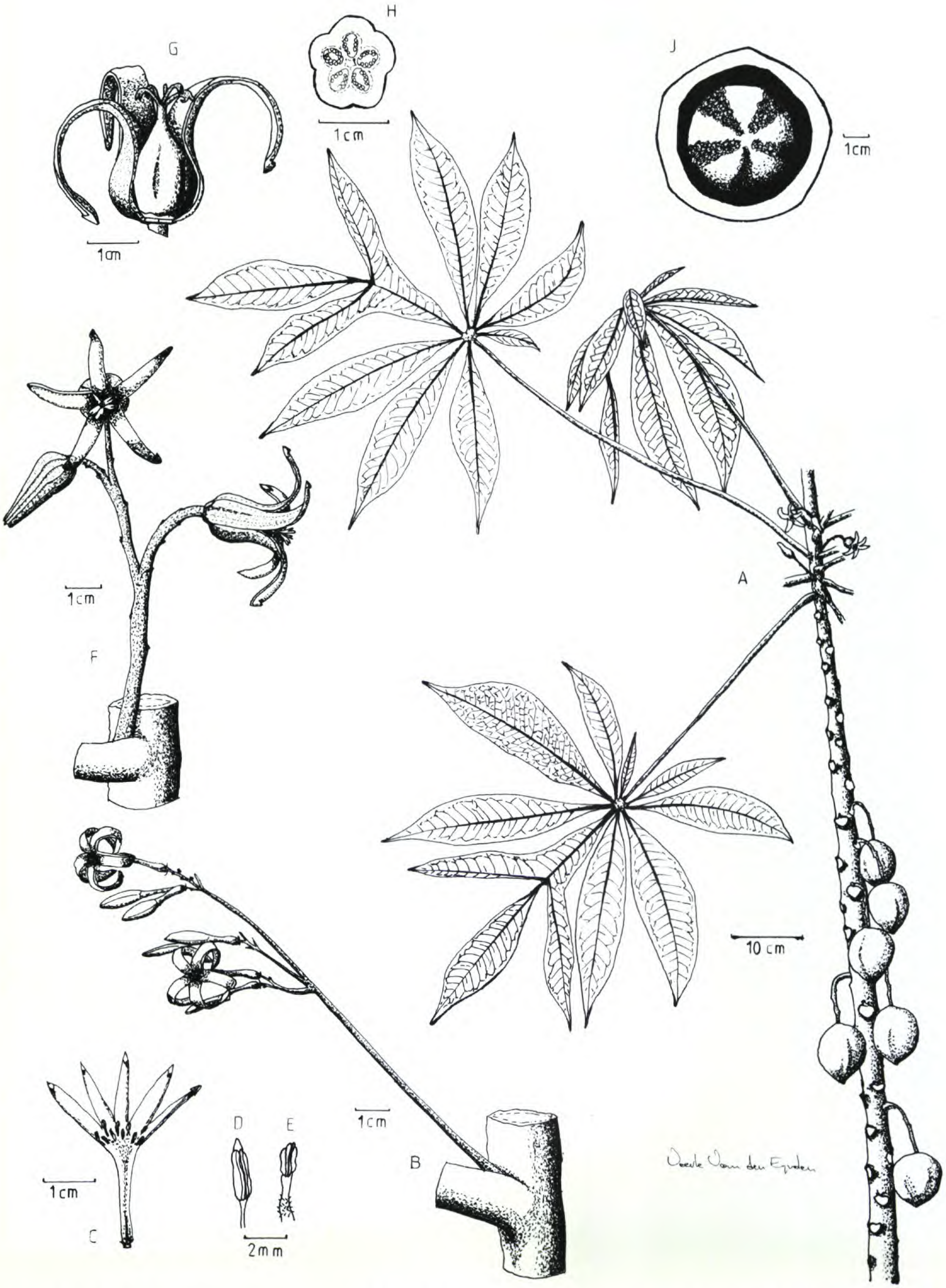

Figure 1. A–J. *Carica palandensis* Badillo, Van den Eynden & Van Damme. —A. Tree. —B. Male inflorescence. —C. Male flower, longitudinal view with perianth removed. —D. Lower stamen. —E. Upper stamen. —F. Female inflorescence. —G. Female flower, longitudinal view with perianth removed. —H. Ovary in cross section. —J. Fruit in cross section. Drawn from photographs, pickled material, and specimens: *Van den Eynden et al. 998* (female plant), *Van den Eynden et al. 999* (male plant), *Van den Eynden et al. 1000* (female plant), and *Van den Eynden et al. 1001* (female plant).

mm long, with a few small bracts to 1 mm long. Male flowers 5-merous. Sepals green, triangular, 1–2 × 0.5–1 mm. Corolla green-yellow (color 144 B of the RHS Color Chart); tube 15–22 mm long, 2–4 mm wide at base, 1.5–2 mm wide in the middle, 2–3 mm wide at apex; lobes oblong-lanceolate, 15–21 × 2–4 mm, apex acute. Sepals and petals alternate. Stamens 10, in 2 series, attached at apex of corolla tube, versatile, 2 thecae each, opening with longitudinal slits, introrse; upper stamens with loosely pilose filaments 2–2.5 mm long, anther glabrous, 2–2.5 mm long, anther connective not prolonged above anther; lower stamens with filament 1 mm long, anther glabrous, 2–2.5 mm long, anther connective prolonged for 1 mm above anther. Rudimentary gynoecium 6–7 mm long. Female inflorescences axillary, cymose, few-flowered, to 9 cm long, slightly pubescent; peduncle 3–4.5 cm long, 3 mm diam.; pedicels 5–15 mm long, with a few small bracts 1 mm long. Female flowers 5-merous. Sepals green-reddish, triangular, 2–3 × 1.5–2 mm. Petals green-yellow (color 145 B-C of the RHS Color Chart) to reddish outside, green inside, pubescent, free, oblong-triangular, 45–60 × 9–12 mm, apex obtuse. Sepals and petals alternate. Ovary superior, 5-locular, 5-angular, 11–19 × 7–13 mm, attenuate toward apex; numerous anatropous ovules on parietal placentas; style 3–4.5 mm long; stigmas 5, 7–10 mm long, shortly pubescent, apically often split in 2 ends of 2–3 mm each. Fruit a subglobose berry, yellow-orange (color 22 A of the RHS Color Chart), base rounded to emarginate, apex acuminate, 72–85 × 64–82 mm; pericarp 7–9 mm thick; pedicel of fruit 9.5–11 × 6–7 mm. Seeds dark brown, 7–8 × 4–5 mm, ellipsoidal, sclerotesta with numerous conical protuberances, each seed surrounded by a gelatinous sarcotesta, seeds arranged in 5 groups surrounded by orange pulp.

Ecology and distribution. The species is known only from the area around Palanda, after which it is named. Palanda is situated at 4°41′S, 79°10′W in the province of Zamora-Chinchipe, Ecuador. It is found in the wild in humid premontane forest at 1790–1850 m elevation. Plants are not cultivated.

Phenology. Plants have been collected in flower (and in bud) and fruit in June and in fruit and with fertilized flowers in December.

Carica palandensis is readily distinguished by its always compound leaves with 5- to 9-petiolulate leaflets. The only other *Carica* species to have (sometimes) palmately compound leaves are *Carica goudotiana* (Triana & Planchon) Solms-Laubach and in a few cases *Carica microcarpa* Jacquin, but never are there 7 or 9 leaflets nor are they all petiolulate (Badillo, 1993). Furthermore this species is characterized by its seeds being arranged in 5 groups, each surrounded by pulp. When opening the fruit, the seeds fall apart in these 5 groups (cf. an orange).

Uses. The sweet pulp surrounding the seeds can be eaten by putting the whole mass of seeds and pulp in the mouth, sucking, and subsequently spitting the seeds out. The seeds and pulp can also be mixed with water and sugar. After stirring and straining off the seeds, a fruity drink results.

Local name. Papaillo.

Paratypes. ECUADOR. **Zamora-Chinchipe:** Palanda, barrio Agua Dulce, camino a las fincas, bosque húmedo premontano, remanente de bosque poco intervenido, 4°41′S, 79°10′W, 1790 m, 21 Dec. 1995, *V. Van den Eynden, E. Cueva & O. Cabrera 549* (LOJA, QCA, QCNE) (female plant); Palanda, barrio Agua Dulce, sector Los Cedros, remanente de bosque, bosque húmedo premontano, 4°41′03″S, 79°10′16″W, 1850 m, 8 June 1997, *V. Van den Eynden, E. Cueva & O. Cabrera 999* (LOJA, QCA, QCNE) (male plant); Palanda, barrio Agua Dulce, sector Los Cedros, remanente de bosque, bosque húmedo premontano, 4°41′03″S, 79°10′16″W, 1850 m, 8 June 1997, *V. Van den Eynden, E. Cueva & O. Cabrera 1000* (LOJA, QCA) (female plant); Palanda, barrio Agua Dulce, sector Los Cedros, remanente de bosque, bosque húmedo premontano, 4°41′03″S, 79°10′16″W, 1850 m, 8 June 1997, *V. Van den Eynden, E. Cueva & O. Cabrera 1001* (LOJA) (female plant).

Acknowledgments. This work was supported by VLIR (Vlaamse Interuniversitaire Raad) and VVOB (Vlaamse Vereniging voor Onderwijs en technische Bijstand) grants to Veerle Van den Eynden. We thank Paul Goetghebeur for help with the Latin description and for useful comments on the manuscript, Gwylim Lewis for help with the correct terminology, and Patricio Mena for checking the Spanish summary.

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Two New Species of *Leymus* (Poaceae: Triticeae) from Qinghai, China

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ABSTRACT. Two new species of *Leymus*, *L. pendulus* and *L. obvipodus*, are described and illustrated. These two species are endemic to Qinghai province, China, occurring at the margins of woodlands, wastelands, mountain valleys, and the bases of walls, at 2280–2900 m elevation. *Leymus pendulus* is unusual in its lax, long, pendent spikes. It is closely related to *L. flexus*, but differs from that species by pendent spikes, longer rachis internodes, and shorter glumes and lemmas. *Leymus obvipodus* is unique in the genus in having all spikelets pedicellate. It resembles both *L. divaricatus* (Drobow) Tzvelev and *L. aristiglumus* L. B. Cai but differs from the former by lanceolate glumes with 1 to 3 nerves, longer spike-like panicles, taller culms, and lanceolate lemmas with 5 obscure nerves and pubescent margins, and from the latter by lax, longer spike-like panicles, pedicellate spikelets with 4 to 8 florets, narrower glumes, and longer, lustrous lemmas.

Leymus, a perennial genus of Triticeae, is widely distributed in the temperate regions of the Northern Hemisphere. It can also be found in South America in alpine belts of tropical or subtropical zones near the equator. Its species grow in a wide range of habitats, usually on mountain slopes, grasslands, margins of woodlands, roadsides, flood beds, and around lakesides, and are highly resistant to cold, drought, alkali, diseases, wind, and rain. Most species of the genus are forage grasses, and some of them are planted over large areas for pasture as they have a high nutritional value. In gross morphology, all members of the genus have well-developed, perennial root systems and are used for soil and sand stabilization. Furthermore, some of these resilient taxa possess the characteristics of long thick spikes and stout caryopses and constitute important gene resources for crop and forage breeding.

Leymus was first described by Hochstetter in 1848. It has been accepted by most recent taxonomists (e.g., Pilger, 1954; Keng, 1959; Tzvelev, 1976; Melderis, 1980; Barkworth & Riley, 1984). The genus currently includes about 40 species, approximately 20 of which occur in China. The genus is mainly characterized by perennial, usually spreading rhizomes. Basal leaf sheaths of most species become fibrous with age. Inflorescences are erect and spiciform or spicate-paniculiform with single or multiple spikelets at the node. These spikelets bear linear-subulate to lanceolate glumes with 1 to 5 veins, scabrous to pubescent lemmas, awnless or shortly awned at their apex, paleas equal to or slightly shorter than the lemmas. Chromosome numbers are $2n = 28, 42, 56, 70, 84$, and the haplomes are N (Zhang & Dvořák, 1991). The genus has close phylogenetic relationships to *Psathyrostachys*, *Hordeum*, and *Elymus* (s. str.) of Triticeae, as well as *Bromus* and *Brachypodium*, which are outside the tribe (Kuo & Wang, 1981; Wang & Kuo, 1982).

Because of its wide geographic distribution and economic importance, *Leymus* has been the focus of considerable research in recent years (Cai, 1995, 1997). As part of this ongoing work, several specimens and seeds were collected in the Qinghai area of China in autumn 1998. Among this material, specimens belonging to two previously unrecognized species of *Leymus* were found. One of the two new taxa has the slender rachises, long internodes, and pendent spikes that are only found in closely related species of *Leymus*, but it differs from the known species in the characters of spikelet, floret, rhizome, and leaf sheath. The second new taxon, *L. obvipodus*, has spikelets always pedicellate and a paniculate or almost racemose inflorescence that resembles those found in *Bromus* and *Brachypodium* rather than members of the Triticeae. Inflorescences of *L. obvipodus* differ from those found in *Bromus* and *Brachypodium* in their spike-like appearance, with the presence of two spikelets at each node.

Leymus pendulus L. B. Cai, sp. nov. TYPE: China. Qinghai Province: Xining, Nan Mts., near the Xining Botanical Garden, alt. 2320 m, 36°36′N, 101°46′E, 12 Aug. 1998, *L. B. Cai & L. Zhi 98022* (holotype, HNWP; isotype, MO). Figure 1.

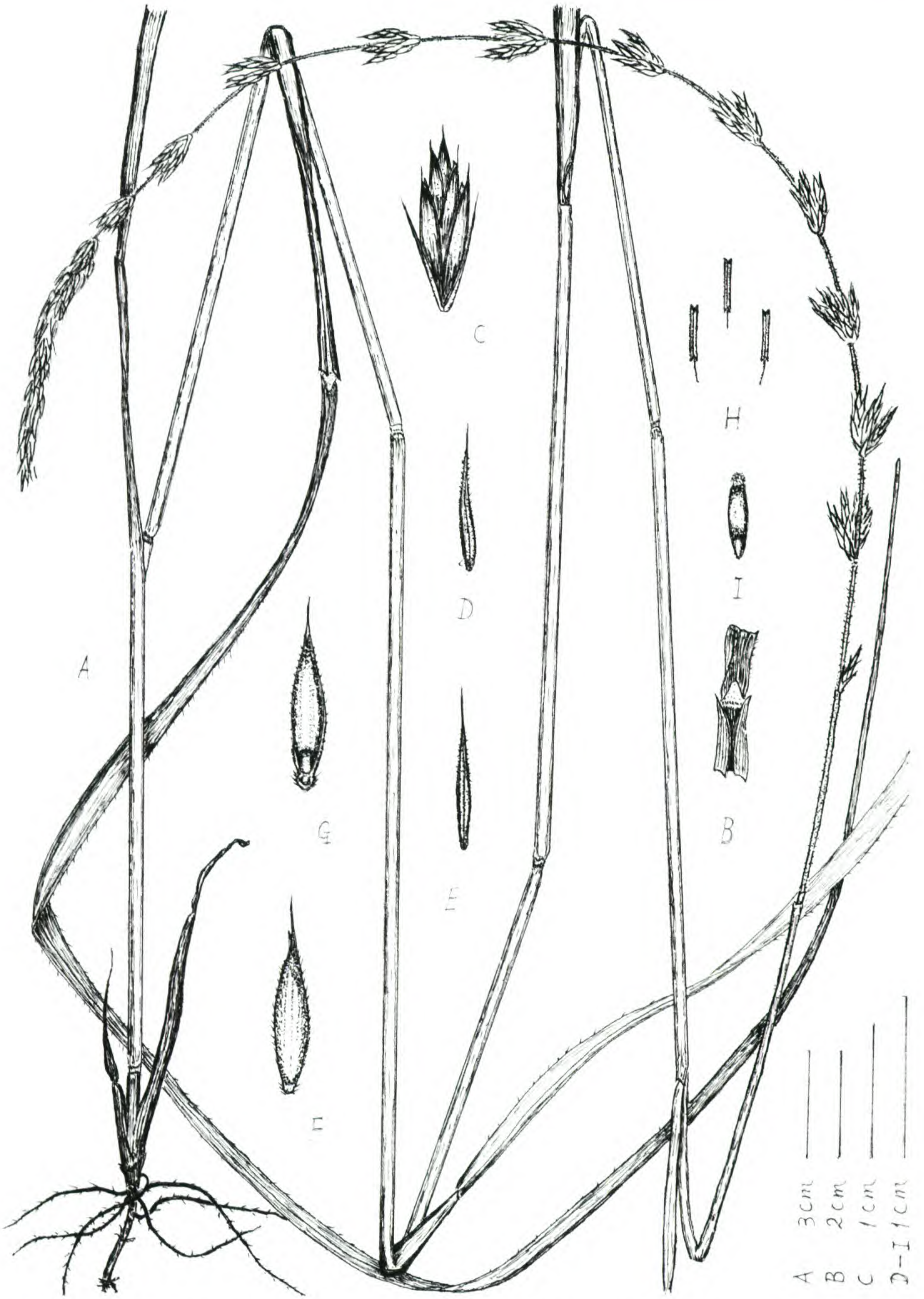

Figure 1. *Leymus pendulus* L. B. Cai. —A. Plant. —B. Junction of sheath and blade to show ligule. —C. Spikelet. —D. First glume. —E. Second glume. —F. Dorsal view of the first floret. —G. Ventral view of the first floret. —H. Anthers. —I. Caryopsis.

Culmi 60–150 cm alti, 4- ad 6-nodes. Spicae 23–32 cm longae, perlaxae, pendulae; rhachidi gracili, partium medianae inferiorisque internodiis plerumque 15–30 mm longis; glumis herbaceis, 9–11 mm longis; lemmate primo 6–9 mm longo (arista exclusa) ; paleis ad carinas sparsim spinulosis.

Perennial herbs, with extended rhizomes. Culms erect or slightly geniculate below, loosely caespitose or solitary, 60–150 cm tall, ca. 2–3 mm diam., smooth, 4- to 6-noded. Leaf sheaths glabrous or scabrid, the lower ones longer and the upper ones shorter than the internodes, the basal sheaths persistent, sometimes disintegrating into fibers; ligules 2–3.5 mm long, hyaline-membranous, obtuse; leaf blades green, flat or involute, lower blades 22–53 × 0.4–0.7 cm, upper blades 5–15 × 0.2–0.5 cm, both surfaces scabrous, the margins sparsely spinulate or ciliate. Spikes very lax, pendent, brownish, 23–32 cm long; rachis slender, densely pubescent; mid and lower internodes generally 15–30 mm long, the upper ones 6–12 mm long; spikelets usually in twos or threes at each node of the rachis, 5- to 7-flowered, 11–15 mm long; rachilla internodes 1–1.5 mm long, densely puberulent; glumes herbaceous, linear-lanceolate, 1-nerved, scabrid on the back, sparsely ciliate at the margins of upper half, nearly equal, 9–11 mm long; lemmas lanceolate, obscurely 5-nerved, sparsely spinulate on the back, pubescent along or near the margin, the first lemma 6–9 mm long, with a gracile 2–3-mm-long awn at the apex; paleas equal to or slightly longer than the lemmas, apically pointed or bifid, 2-keeled, sparsely spinulate along the keels, scabrous between the keels. Anthers yellow or purplish, 2.5–3.5 mm long. Caryopses brown, ca. 5 × 1.2 mm, pubescent at the apex, adherent to the lemma and palea.

Distribution and habitat. *Leymus pendulus* is known only from the type collections. It is endemic to the eastern part of Qinghai Province, China, where it grows at the margins of woodlands, mountain valleys, and the bases of walls at an altitude of 2280 to 2320 m on soils that are reddish and sandy to clayey.

This species is recognized morphologically from other species of *Leymus* by its slender rachises, long internodes, and pendent spikes. The general appearance of spikes in *L. flexus* suggests some similarity with *L. pendulus*, but *L. flexus* has longer glumes and lemmas, shorter rachis internodes, ciliate paleas, and slightly flexuous spikes. The two species may be easily distinguished by the following key:

1a. Spike pendent, 23–32 cm long; rachis internodes 15–30 mm long in the lower half; glumes herbaceous, 9–11 mm long; lemma 6–9 mm long (excluding awn); palea spinulate on the keels; culm 4- to 6-noded . . . . . *L. pendulus* L. B. Cai

1b. Spike slightly flexuous, 15–25 cm long; rachis internodes 8–15 mm long in the lower half; glumes membranous at the margins, 11–14 mm long; lemma 9–10 mm long (excluding awn); palea ciliate on the keels; culm 3- to 4-noded . . . . . *L. flexus* L. B. Cai

Paratype. CHINA. **Qinghai:** Xining to Datong highway 24 Km, Datong County, alt. 2280 m, 36°49′N, 101°45′E, 2 Aug. 1998, *L. B. Cai 9805* (HNWP).

Leymus obvipodus L. B. Cai, sp. nov. TYPE: China. Qinghai Province: Dulan County, Farm Nuomuhong, alt. 2900 m, 36°29′N, 96°27′E, 25 Aug. 1998, *L. B. Cai & L. Zhi 98084* (holotype, HNWP; isotype, MO). Figure 2.

Culmi 40–75 cm alti. Inflorescentia ex panicula spiciformi 8–18 cm longa constans; rhachidi e quoque nodo spiculas unam vel duas manifeste pedunculatas 4- ad 8-floras gerente; glumis lineari-lanceolatis vel lanceolatis, 1- ad 3-nervibus; lemmatibus lanceolatis, nitidis, obscure 5-nervibus, secus vel prope margines pubescentibus, lemmate primo 7–10 mm longo.

Perennial herbs, with extended rhizomes. Culms solitary or loosely caespitose, erect or slightly geniculate below, 40–75 cm tall, 2–3 mm diam., 2- to 3-noded, densely pubescent just below the spike. Leaf sheaths sometimes puberulent, the basal sheaths persistent, becoming fibrous; ligules 1–2 mm long, membranous, obtuse; leaf blades involute, 6–18 × 0.2–0.4 cm, upper and lower surfaces densely puberulent. Spike-like panicles erect, lax, greenish, 8–18 × 0.6–0.8 cm; rachis internodes generally 5–20 mm long or basal ones up to 50 mm, all densely pubescent; spikelets 1 or 2 at each node of the rachis, all pedicellate, 4- to 8-flowered, 11–18 mm long (excluding pedicel); pedicels densely pubescent, 1–14 mm long; rachilla internodes 0.5–2 mm long, densely puberulent; glumes linear-lanceolate or lanceolate, 1- to 3-nerved, glabrous or scabrid on the back, membranous along the margins, gradually tapering into an awn 2–4 mm long; first glume 5–6.5 mm long (excluding awn), second glume 6–7.5 mm long; lemmas lanceolate, lustrous, glabrous or scabrid on the back, pubescent along or near the margins, obscurely 5-nerved; first lemma 7–10 mm long, with a short mucro 1–3 mm long; paleas slightly shorter than the lemmas, 2-keeled, bifid, sparsely spinulate along the keels, glabrous between the keels. Anthers yellowish, ca. 4 mm long. Caryopses brown, pubescent at the apex, ca. 4.9 × 1.1 mm, adherent to the lemma and palea.

Distribution and habitat. *Leymus obvipodus* is

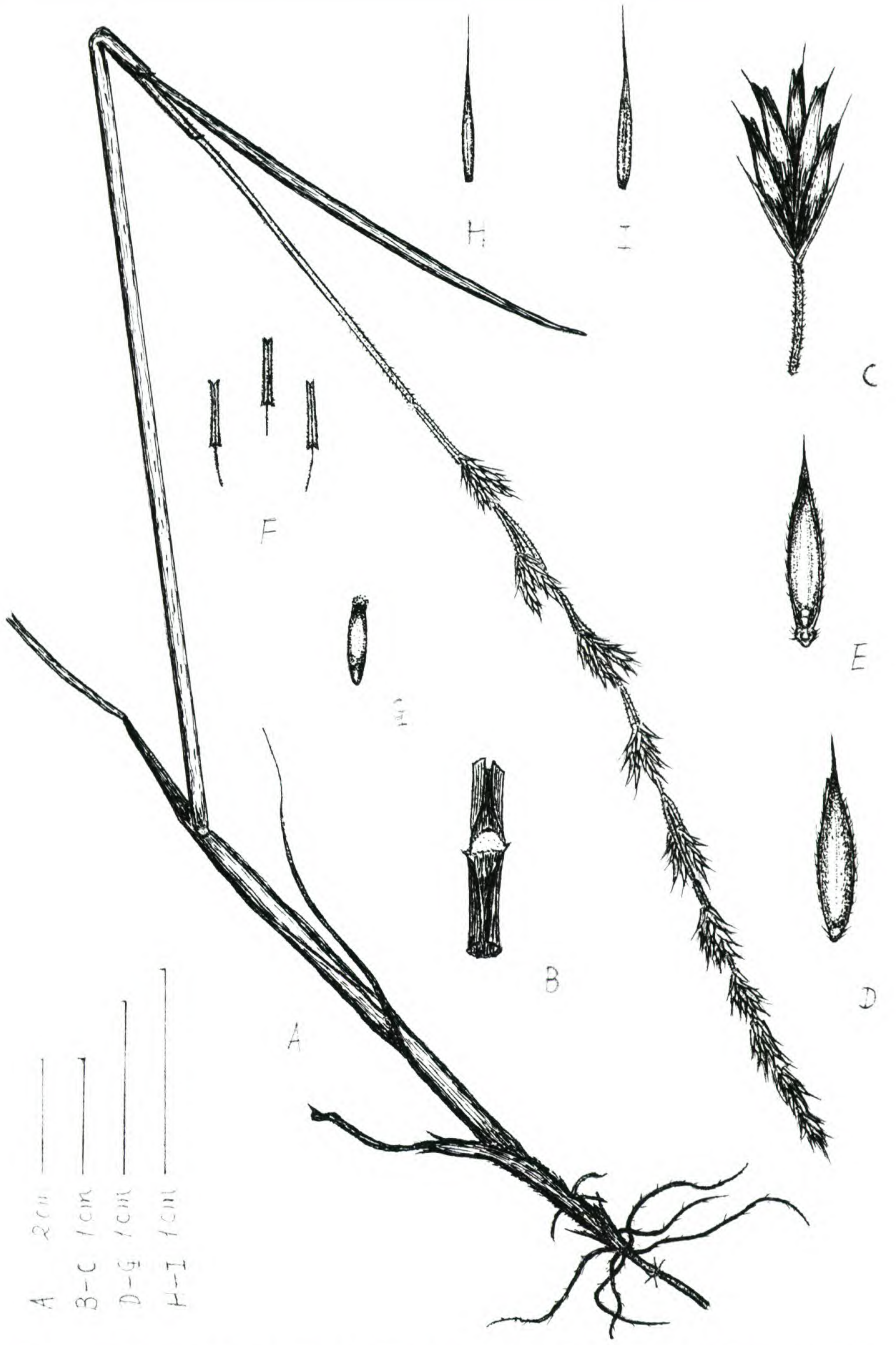

Figure 2. *Leymus obvipodus* L. B. Cai. —A. Plant. —B. Junction of sheath and blade to show ligule. —C. Spikelet. —D. Dorsal view of the first floret. —E. Ventral view of the first floret. —F. Anthers. —G. Caryopsis. —H. First glume. —I. Second glume.

known only from the type collections. It is restricted to the middle and eastern parts of Qinghai province, China, growing at the margins of woodlands and in wastelands at an altitude of 2280 to 2900 m on soils that are blackish and sandy.

This species was initially identified as *Leymus divaricatus*, but differs by its always pedicellate spikelets, lanceolate or linear-lanceolate glumes with 1 to 3 nerves, longer spike-like panicles, taller culms, and lanceolate lemmas with 5 obscure nerves and pubescent margins. In geographic range, moreover, *L. divaricatus* is distributed in central Asia and *L. obvipodus* in China. *Leymus obvipodus* is closely related to *L. aristiglumus* from Qinghai, China, differing by its lax, longer spike-like panicles, pedicellate spikelets with 4 to 8 florets, narrower glumes, and longer, lustrous lemmas. It may be distinguished from these species by the following key:

1a. Spikelets 1 or 2 at each node of the rachis, pedicellate or partly pedicellate, 4- to 10-flowered; lemma lustrous, usually 7–10 mm long.
  2a. Spikelets partly pedicellate; glumes linear-subulate, obscurely 1-nerved; lemma broadly lanceolate, 5- to 7-nerved, glabrous; spike 6–10 cm long; culm 20–40 cm high . . . . . *L. divaricatus* (Drobow) Tzvelev
  2b. Spikelets always pedicellate; glumes linear-lanceolate or lanceolate, 1- to 3-nerved; lemma lanceolate, obscurely 5-nerved, pubescent along or near the margins; spike-like panicle 8–18 cm long; culm 40–75 cm high . . . . . *L. obvipodus* L. B. Cai
1b. Spikelets 2 or 3 at each node of the rachis, sessile, 3- to 4-flowered; lemma not lustrous, usually 6–7 mm long . . . . . *L. aristiglumus* L. B. Cai

Paratype. CHINA. **Qinghai:** Xining to Huang yuan highway 4 km, Xining, alt. 2280 m, 36°36′N, 101°44′E, 30 Aug. 1998, *L. B. Cai & B. H. Ma 9828* (HNWP).

Acknowledgments. I thank Zhao Xin-quan for help in the preparation of the manuscript, Ma Bi-hua and Zhi Li for assistance with fieldwork, and Yang Zhi-xia for making the type collections.

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A New Varietal Combination in a Central American *Hydrolea* (Hydrophyllaceae)

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ABSTRACT. The new combination *Hydrolea spinosa* var. *cervantesii* (Brand) L. J. Davenport & A. Pool is proposed for the illegitimate name *Hydrolea spinosa* var. *maior* (Brand) L. J. Davenport.

In the process of editing the Hydrophyllaceae for the *Flora de Nicaragua*, the junior author discovered a range extension into Nicaragua (Estelí, *Moreno 25138*, MO) of *Hydrolea spinosa* var. *maior* (Brand) L. J. Davenport. This taxon—native to stream and pond margins, like other members of the genus—was previously reported only from the Pacific slope of Mexico and Guatemala. Along with the range extension, an error in the original publication of its name was noted.

In Davenport's (1988) monograph of *Hydrolea*, he proposed the new combination *Hydrolea spinosa* L. var. *maior* (Brand) L. J. Davenport based on *Hydrolea cervantesii* Brand var. *maior* Brand. *Hydrolea cervantesii* was cited as a synonym of this new combination; i.e., the type of *H. cervantesii* was included within the circumscription of the varietal taxon.

When Brand (1913) proposed his variety *maior*, he automatically established the autonym *Hydrolea cervantesii* var. *cervantesii*. Following Article 11.6 of the *International Code of Botanical Nomenclature* (Greuter et al., 1994), the autonym has priority over names of the same date that established it. Therefore, *H. cervantesii* var. *cervantesii* has priority over *H. cervantesii* var. *maior* at varietal rank. Since the types of both *cervantesii* and *maior* are included within a single varietal circumscription, a new trinomial combination in *Hydrolea spinosa* is needed and so is proposed below.

Hydrolea spinosa L. var. **cervantesii** (Brand) L. J. Davenport & A. Pool, comb. nov. Basionym: *Hydrolea cervantesii* Brand var. *cervantesii*, in Engler, Pflanzenr. IV. 251 (Heft 59): 184. 1913. TYPE: Mexico. *Cervantes s.n.* (not seen; possibly with other Cervantes material at BR, B, MA, or MEXU [Lanjouw & Stafleu, 1954]).

Hydrolea cervantesii var. *maior* Brand, in Engler, Pflanzenr. IV. 251 (Heft 59): 184. 1913. Syn. nov. *Hydrolea spinosa* var. *maior* (Brand) L. J. Davenport, Rhodora 90: 187. 1988. TYPE: Mexico. Michoacán or Guerrero: El Ocote, 12 Nov. 1898, *Langlassé 619* (holotype, G not seen; isotypes, GH, US).

Acknowledgments. We thank W. D. Stevens for his advice and encouragement.

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A New Name in Chinese *Dioscorea* (Dioscoreaceae)

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ABSTRACT. During preparation of the account of Dioscoreaceae for the *Flora of China*, it was noticed that one species is illegitimately named, being a later homonym: *Dioscorea parviflora* C. T. Ting (1979), not Philippi (1864). The following new name (nomen novum) is therefore proposed here: *D. sinoparviflora* C. T. Ting, M. G. Gilbert & Turland.

Dioscorea sinoparviflora C. T. Ting, M. G. Gilbert & Turland, nom. nov. Replaced name: *Dioscorea parviflora* C. T. Ting, in C. Pei et al., Acta Phytotax. Sin. 17(3): 69. 1979. Not Philippi, Linnaea 33: 257. 1864. TYPE: China. Yunnan: Yongsheng Xian, Xinghe, 1600 m, Mar. 1963, *Q. Y. Liang 63009* (holotype, NAS).

Dioscorea parviflora C. T. Ting (in Pei et al., 1979: 69–70) was described from Yongsheng County (Xian) in northwestern Yunnan Province, China. Unfortunately, the name is illegitimate under Article 53.1 of the *Tokyo Code* (Greuter et al., 1994) because an earlier homonym exists: *D. parviflora* Philippi (1864), described from Chile. The Chinese species will be accepted by Ding and Gilbert, as endemic to Yunnan Province, in their forthcoming account of Dioscoreaceae in the *Flora of China* (in press). Therefore, a new name for *D. parviflora* is required, and *D. sinoparviflora* C. T. Ting, M. G. Gilbert & Turland is proposed here. *Dioscorea sinoparviflora* is most similar to *D. zingiberensis* C. H. Wright, which is also endemic to China, occurring in Gansu, Henan, Hubei, Hunan, Shaanxi, Sichuan, and Yunnan provinces. *Dioscorea sinoparviflora* differs from *D. zingiberensis* in having perianth lobes 0.8–1.2 × 0.6–0.8 mm (vs. 1.2–1.5 × 0.8–1 mm) and capsules longer than wide (vs. ca. as long as wide). Both species can be readily distinguished from others in China by the peltate attachment of most leaf blades. Moreover, *D. zingiberensis* is the only Chinese species recorded as being monoecious.

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New Species of *Moraea* (Iridaceae–Iridoideae) from Southern Africa

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ABSTRACT. *Moraea melanops*, *M. deltoidea*, *M. vespertina*, and *M. vigilans* are new species of the southern African genus *Moraea* (ca. 195 species), of subfamily Iridoideae of the Iridaceae. *Moraea vespertina* belongs to subgenus *Visciramosa*, now comprising six species. It has the characteristic branched stems, viscous secretion on the nodes and internodes, and free, connivent anthers of the subgenus, but is distinctive in its white flowers that open for a few hours in the late afternoon, and basal fan of four to six, firm-textured leaves. *Moraea deltoidea*, from the Klein River Mountains in Western Cape Province, and *M. vigilans*, from the northern high Drakensberg of Free State and KwaZulu-Natal, belong in subgenus *Vieusseuxia* and are allied to the *M. unguiculata* complex of the subgenus. *Moraea deltoidea* has vestigial style branches and inner tepals that are more or less entire to obscurely three-lobed. *Moraea melanops* is the eighth species of section *Galaxia* series *Eurystigma*, one of two series of the exclusively western southern African section of 16 species distributed from the Bredasdorp District of Western Cape Province to northern Namaqualand in Northern Cape Province. Vegetatively resembling other Western Cape species, including *M. barnardiella* and *M. versicolor*, *M. melanops* can be distinguished by its purple to lilac perianth with a dark purple-black center, and stamens partly to entirely free; like *M. barnardiella* it has laxly spreading tepals that do not form a floral cup.

Moraea, with some 195 species (Goldblatt, 1998), is the largest African genus of tribe Irideae of Iridoideae, one of four subfamilies of the Iridaceae as currently recognized. The genus is defined by bifacial, channeled to flat leaves and a unique type of cormous rootstock consisting of a single enlarged internode that is derived entirely from an axillary bud. The genus is currently divided into five subgenera (Goldblatt, 1986). Subgenus *Visciramosa*, to which the new *M. vespertina* belongs, is restricted to the southern African winter-rainfall zone and now includes six species. Two more new species belong in the southern African and largely winter-rainfall subgenus *Vieusseuxia* and appear to be allied to a complex of species, the most widespread and common of which is the small-flowered *M. unguiculata* Ker Gawler. *Moraea deltoidea*, which has vestigial style crests and undivided, lanceolate inner tepals, is restricted to the mountains around Hermanus on the southern coast of Western Cape Province. *Moraea vigilans* occurs in the high Drakensberg of Free State and KwaZulu-Natal Provinces of South Africa and northeastern Lesotho. Also restricted to the southern African winter-rainfall zone is *Moraea melanops* of section *Galaxia*, which now includes 16 species, evenly shared among two series. The new *M. melanops* belongs to series *Eurystigma*, most species of which, like *M. melanops*, have broadly lanceolate to ovate leaves and flowers in shades of pink to lilac.

1. Moraea vespertina Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Northern Cape Province: Calvinia District, rocky hills E of Nieuwoudtville, 31 Oct. 1996, *Goldblatt & Manning 10580* (holotype, NBG; isotypes, K, MO, PRE). Figure 1A.

Plantae 70–100 cm altae, cormo globoso 15–25 mm diametro tunicis reticulatis fibrosis brunneis obtecto, foliis usitate 4–6 linearibus 5–8 mm latis, caule perramoso, spatha interne inflorescentis 40–45 mm longis, floribus albis flavis notatis, tepalorum oblongorum unguiculatorum limbis reflexis, externorum unguibus arcuatis ca. 11 mm longis, limbis 30–35 × ca. 15 mm, internorum limbis ca. 30 × ca. 9 mm, filamentis 7–8 mm longis inferne in columnam gracilem conniventibus superne per 1.5 mm divergentibus, antheris albis ca. 6 mm longis, styli ramis ca. 8 mm longis cristis anguste linearibus erectis ca. 15 mm longis ornatis, ovario exserto anguste clavato truncatis ca. 10 mm longo, capsulis ovoideis, 18–25 mm longis.

Plants 70–100 cm high. *Corm* globose, 15–25

Figure 1. —A. *Moraea vespertina* (*Goldblatt & Manning 10580*). —B. *Moraea deltoidea* (*Hanekom s.n.*). Scale bar 1 cm. Drawn by J. C. Manning.

mm diam., the tunics of coarse, red-brown fibers connected in herringbone fashion by fine cross fibers. *Cataphylls* papery, uppermost reaching shortly above the ground, becoming dry and dark brown by flowering time, then often irregularly broken. *Foliage leaves* usually four to six, the lower three to five basal, distichous, the blades channeled, arching outward, mostly 5–8 mm wide, the uppermost cauline and shorter than the basal. *Stem* erect, the main axis lightly flexuose, viscous below the nodes for half the length of an internode, bearing an entirely sheathing bract-like leaf at each of the upper nodes, these 4–6.5 mm long, green below, dry and light brown above, the apices attenuate and dry, bearing one or rarely two lateral branches at each of the upper three or four nodes, those at the lower nodes sometimes two internodes long and also branched, the branches erect and parallel to the stem below, flexed outward above the sheathing leaf. *Inflorescence* a rhipidium, terminal on the branches, several-flowered; *spathes* unequal, dull green, becoming somewhat purplish with age, the margins dry and membranous, with dry, brown attenuate apices, the outer 20–25 mm long, the inner 40–45 mm long. *Flowers* white, almost translucent, the outer tepals each with a yellow nectar guide streaked with darker veins at the limb base, lightly lemon-scented, the tepal claws arching upward and forming a cup enclosing the filaments and anther bases; *tepals* clawed, the outer larger than the inner, the claws arcuate, erect above, 10–11 mm long, claws of the outer tepals reaching to about the middle of the anthers and with a large basal green nectary, the limbs lanceolate, narrowly acute to attenuate, spreading horizontally or dipping up to 45° below the horizontal, the outer 30–35 × ca. 15 mm, the inner 28–30 × 8–9 mm. *Filaments* 7–8 mm long, free but connivent below and forming a slender column, diverging in the upper 1.5 mm; *anthers* ca. 6 mm long, oblong but wider below and with the connective evident on the abaxial side, appressed to the style branches, white, the pollen white. *Ovary* exserted, narrowly club-shaped, ca. 10 mm long; *style* dividing at the apex of the filament column, the branches ca. 8 × 8 mm, ascending, the stigmatic flap bilobed with a sterile acute central appendage, the crests linear, erect, ca. 15 mm long. *Capsules* narrowly ovoid to oblong, 18–25 mm long, suberect to nearly horizontal; *seeds* angular, the angles ± ridged to winged, ca. 4–5 × 3 mm, dark brown.

Flowering October and early November; flowers open at 4:00–4:30 P.M. and wilt at 7:30–8:00 P.M.

Etymology. From the Latin *vespertina*, "early evening," referring to flower phenology, opening in the late afternoon and lasting until shortly after nightfall.

Distribution and biology. *Moraea vespertina* is endemic to the Bokkeveld Escarpment near Nieuwoudtville in the Calvinia District of Northern Cape Province, South Africa. It occurs in a very specialized habitat and is currently known only from two relatively small populations a short distance east and northeast of the town of Nieuwoudtville. Plants grow in heavy red doleritic clay soil in low outcrops of dolerite. Drainage is poor and the ground remains waterlogged for most of the growing season, sometimes even into flowering time in early November. This peculiar habitat is home to a characteristic suite of species, including *Berkheya glabrata* (Thunberg) Fourcade (Asteraceae), *Sparaxis pillansii* L. Bolus (Iridaceae), and *Zantedeschia odorata* P. Perry (Araceae), which are rare elsewhere, and *Cyanella aquatica* G. Scott (Tecophilaeaceae), which occurs nowhere else.

Relationships. The sixth member of the taxonomically isolated subgenus *Visciramosa* (Goldblatt, 1976, 1986), *Moraea vespertina* has the typical attributes of the subgenus, including sticky internodes, multiple leaves, branched stems, relatively short inflorescence spathes, and free, connivent filaments. It is distinctive in having four to six foliage leaves, whereas other species of the subgenus rarely have more than two, and a large white, lightly scented flower that opens in the late afternoon. The flowers are fairly typical of the genus in having larger outer tepals with a spreading limb bearing a nectar guide at the base, smaller, unmarked inner tepals, and broad style crests with prominent, erect crests. The only other white-flowered species of the subgenus, *M. viscaria* (L.f.) Ker Gawler, is a smaller plant that has small, strongly scented flowers that open in the middle of the afternoon. At present, we cannot suggest any species within subgenus *Visciramosa* as being obviously allied to *M. vespertina*. The presence of multiple leaves is often a plesiomorphic character, and on this basis *M. vespertina* might be regarded as the least derived species in the subgenus. Other species have two, or rarely three, leaves, and favor well-drained habitats, usually in sandy soil.

2. Moraea deltoidea Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Western Cape: Klein River Mountains, Vogelgat Nature Reserve, near Mainstream, 23 Nov. 1996, *Hanekom s.n.* (holotype, NBG; isotypes, MO, PRE). Figure 1B.

Plantae 30–40 cm altae, cormo globoso 8–14 mm diametro, folio solitario producto lineari canaliculato 1.5–2 mm lato, caule ramoso flexuoso, spatha interna inflorescentis 45–50 mm longa externa longitudine circa dimidio inclusa constante, floribus cremeo-flavis tepalis externis atropunctatis 19–21 mm longis, internis oblanceolatis ca. 14 × 4 mm, filamentis 5–6.5 mm longis in columnam 4–5 mm longo connatis, antheris 4–6 mm longis luteis, styli ramis 5–6 mm longis cristis deltoideis fere 1 mm longis ornatis, capsulis clavato-ellipsoideis 8–10 mm longis.

Plants 30–40 cm high. *Corm* globose, 8–14 mm diam., with tunics of light brown, finely textured fibers. *Cataphyll* usually dry and brown at flowering, usually irregularly torn into fibrous strips. *Foliage leaf* solitary, linear, channeled, exceeding the stem, usually bent and trailing above, 1.5–2 mm wide. *Stem* erect below, usually curving outward below the nodes, usually 3 internodes long, branching at each node or only at the uppermost, with up to 3 branches per node, the branches sometimes also branched, with sheathing, bract-like leaves 35–45 mm long at the nodes. *Inflorescence* a rhipidium, terminal, several-flowered; *spathes* unequal, attenuate, green below, dry and membranous toward the apices, the inner 45–50 mm long, the outer about half as long. *Flowers* pale creamy yellow, the outer tepals with dark speckles at the base of the limb and on the claw, the claws spreading at ca. 60° from the vertical, forming a wide cup including the stamens and style branches, the limbs lightly reflexed; *outer tepals* broadly obovate, 19–21 mm long, the limb 10–12 × 8–9 mm; *inner tepals* oblanceolate, ca. 14 × 4 mm. *Filaments* united in the lower two thirds in a slender column, 4–5 mm long, free and diverging in the upper 1–1.5 mm; *anthers* 4–6 mm long, widely diverging, cream, the pollen orange, slightly exceeding the stigmatic lobes and occasionally just exceeding the crests. *Ovary* included or partly exserted, ca. 4 mm long; *style branches* slightly wider than the anthers, 5–6 mm long, *crests* broadly deltoid, slightly less than 1 mm long. *Capsules* club-shaped to ellipsoid, 8–10 mm long, well exserted; *seeds* narrowly prismatic, ca. 2 × 1 mm.

Flowering October and November.

Etymology. From the Latin *deltoideus*, "broadly triangular or D-shaped," referring to the shape of the reduced, very short style crests.

Distribution and biology. Moraea deltoidea is restricted to the southern coast of Western Cape Province between Kleinmond and the Klein River Mountains, near Hermanus. Most of the collections are from the immediate vicinity of Hermanus, either in Fernkloof Nature Reserve or Vogelgat, but we suspect the species has a wider range in these mountains, which extend eastward to Stanford and Akkediskloof.

The few specimens of *Moraea deltoidea* collected in the past were included in the widespread, and fairly variable, *M. unguiculata* Ker Gawler, which occurs almost throughout the southern African winter-rainfall zone (Goldblatt, 1986). The two have the same general aspect and vegetative appearance, including the solitary, narrow leaf, branched stem, and fairly slender habit. The differences between the two are restricted to the flowers. *Moraea deltoidea* has oblanceolate inner tepals with a broad claw and a short, somewhat attenuate limb extending outward or reflexed to the same degree as the outer tepal limbs. In *M. unguiculata* the inner tepals consistently have a fairly narrow claw and trilobed limb consisting of two shorter, obtuse lateral lobes and a slender, tapering central lobe that coils inward (Goldblatt, 1986; Goldblatt & Manning, 1995). The style crests of *M. unguiculata* are usually well developed and lanceolate, thus longer than wide. In *M. deltoidea* the crests are deltoid, and wider than high. *Moraea unguiculata* is most frequently found on clay slopes, less often on dry sandstone soils, whereas *M. deltoidea* occurs exclusively on well-watered, south-facing rocky sandstone slopes. Available information from amateur naturalists indicates that it flowers only after wildfires.

Moraea deltoidea may also be confused with *M. tricuspidata* D. Delaroche, which typically has larger, white or cream flowers. The trilobed inner tepals of this species have short, fairly broad, obtuse outer lobes and a short, narrow central lobe that curves inward obliquely, but is not coiled as is typical of the central inner tepal lobe in *M. unguiculata*.

Paratypes. SOUTH AFRICA. **Western Cape:** 3419 (Caledon) Kleinmond (AC), 15 Oct. 1996, *Mostert 200* (NBG); Onrus Mountains, Glen Fruin, on burnt, peaty sandstone slope, Nov. 1991, *Barker 303* (K, MO, NBG, PRE); Vogelgat Nature Reserve (AD), 12 Nov. 1986, *Williams 3731* (NBG), 20 Oct. 1982, *Williams 3350* (NBG). Fernkloof Nature Reserve, Droekloof, 13 Nov. 1996, *Drewe 1016* (NBG); Fernkloof Nature Reserve, Gandoger's marsh, 23 Nov. 1996, *Drewe 1073* (MO, NBG).

3. Moraea vigilans Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Free State: slopes of The Sentinel, 15 Feb. 1999, *Goldblatt & Manning 11046* (holotype, NBG; isotypes, K, MO, PRE). Figures 2, 3.

Plantae 50–70 cm altae, cormo globoso 8–15(–20) mm diametro tunicis fibrosis obtecto, folio producto solitario canaliculato lineari, caule ramoso flexuoso, inflorescentiae spatha externa 30–35 mm longa, interna 50–55 mm longa, floribus leviter odoratis, tepalorum externorum 24–28 mm longorum, ungue 7–9 mm longo, limbo obovato-rotundato albo leviter vel dense malvino-maculato, tepalis internis

Figure 2. Comparison of the flowers of *Moraea vigilans* (left) and *M. brevistyla* (right), photographed in the field.

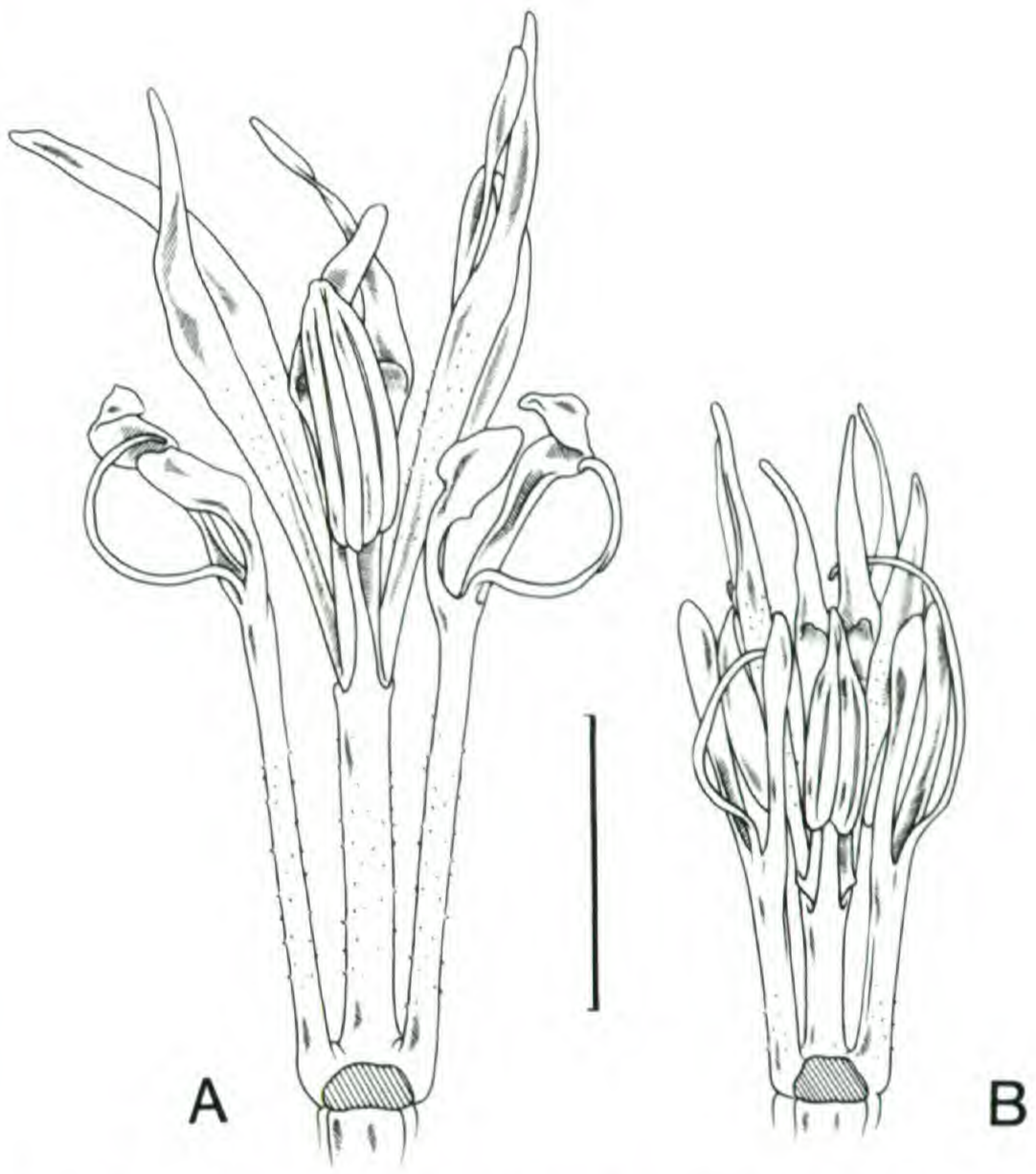

Figure 3. Inner tepals and stamen-style branch apparatus of *Moraea brevistyla* (A) and *M. vigilans* (B), (*Goldblatt & Manning 11046*). Scale bar 5 mm. Drawn by J. C. Manning.

tricuspidatis, brunneis 8.5–10 mm longis, filamentis in columnam 3 mm longa connatis apicem versus per 1–1.5 mm liberis, ramis styli ca. 4 mm longis cristis brunneis 3–4 mm longis ornatis.

Plants 50–70 cm high. Corm globose, 8–15(–20) mm diam. with fibrous tunics. *Foliage leaf* solitary, produced close to the ground, channeled and often about as long as the stem but usually bent and trailing above, linear, 3–4 mm wide. *Stem* 3 or 4 internodes long, usually branched at the 2 upper internodes, with up to 4 branches per node, each node bearing a sheathing, bract-like leaf 4.2–5 cm long, this green with a dry, brown, acute apex. *Rhipidia* terminal on the branches, flexed at the base, 3–4(–5)-flowered; *spathes* green, with dry, brown, acute(–attenuate) apices, the outer 30–35 mm long, the inner 50–55 mm long. *Flowers* usually white, often faintly tinged with mauve especially on the outside, the outer tepal limbs with bluish bands or spots toward the base and speckled with mauve over the lower third, sometimes over the lower two-thirds, rarely over the entire surface, the claws banded with mauve, the inner tepals brownish, speckled with cream, lightly sweet scented; *outer tepals* 24–28 mm long, evidently glabrous, the claw ascending, 7–9 mm long, with a small oblong nectary at the base, the nectary covered by a flap of tissue ca. 2 mm long, the limb orbicular to broadly ovate, held slightly above the horizontal, 18–20 × 14–17 mm; *inner tepals* 8.5–10 mm long, the claw ca. 3.5 mm long, erect, the limb tricuspidate, with outer lobes spathulate and erect, 5–6 mm long, inner lobe filiform, arching outward, mostly 4–6 mm long. *Filaments* united in a column ca. 3 mm long, diverging in the upper 1–1.5 mm; *anthers* appressed to the style branches, ca. 4 mm long, bluish, with acute apex, pollen yellow. *Ovary* oblong, 5–6 mm long; *style* dividing at the top of the filament column, the branches 4–5 mm long, reaching the apex of the outer tepal claws, the crests narrowly triangular, 3–4 mm long, brown. *Capsules* oblong, 12–15 × ca. 5 mm; *seeds* angular, ca. 1.2 mm long.

Flowering January to mid February.

Etymology. From the Latin *vigilans*, "vigilant, watchful," referring to the type locality, Sentinel Peak in the northern high Drakensberg Range.

Distribution and biology. *Moraea vigilans* is evidently a local endemic of the high Drakensberg presently known only from the slopes of The Sentinel, which lies close to the borders of KwaZulu-Natal and Free State Provinces of South Africa and the northeast corner of the landlocked kingdom of Lesotho. Plants are locally common on steep, moist

slopes in basalt outcrops where they grow in peaty loam. In this well-watered part of the Drakensberg, the ground remains moist throughout the growing season, November to March. We have no observations on the pollination of *M. vigilans* but assume that, like its relatives *M. brevistyla* (Goldblatt) Goldblatt and *M. trifida* R. C. Foster, it is pollinated by anthophrine bees in search of the small quantity of nectar held at the base of each outer tepal claw (Goldblatt et al., 1989, and unpublished data). It is puzzling, however, that while we have seen the large bee, *Amegilla capensis*, visiting *M. brevistyla* on three separate occasions and *M. trifida* once, no visits occurred to *M. vigilans*, although that bee was active when the plant was in bloom and it was growing within a few meters of the other two *Moraea* species.

Relationships. *Moraea vigilans* has the relatively small flower that lasts at least two days, and reduced, tricuspidate inner tepals characteristic of subgenus *Vieusseuxia* of the genus. Within the section it is evidently allied to other Drakensberg species of the subgenus, and is perhaps most closely related to the common and widespread Drakensberg species *M. brevistyla* (Goldblatt, 1986), with which it is easily confused. Herbarium specimens of the two species can only be distinguished by careful measurement of the floral parts, but when seen alive the difference in tepal orientation and coloring makes it immediately clear that these are separate species (Fig. 2). They actually grow within a few meters of one another on the slopes of The Sentinel: *M. brevistyla* grows on deeper soils on grassy slopes and *M. vigilans* is confined to basalt outcrops. Their flowering times overlap, and they can readily be compared with one another. It then becomes obvious that they are separate species. The most striking difference between the two is that the broadly ovate to orbicular outer tepal limbs of *M. vigilans* are spreading or held up to 30° above the plane defined by a right angle relative to the rhipidium-ovary axis. In contrast, the narrower, oblanceolate-obovate outer tepal limbs of *M. brevistyla* are weakly to strongly reflexed, and the limbs are usually pinched inward in the proximal third. Less apparent are the shorter outer tepal claws of *M. vigilans*, 7–9 mm long, and the shorter filament column and style branches, the latter reaching opposite the apex of the outer tepal limb. The short, brownish crests extend upward above the base of the tepal limbs for up to 4 mm. The outer tepal claws of *M. brevistyla* are 9–11 mm long, the filaments and anthers are longer than those of *M. vigilans* (12–15 mm combined length in *M. brevistyla* vs. ca. 8.5 mm in *M. vigilans*), and the style branches usually exceed the outer tepal limbs by up to 3.5 mm, while the white style crests extend upward a further 5 mm (Fig. 3). Although the two species appear virtually identical vegetatively, the stalks of *M. vigilans* are more willowy and tend to lean toward the ground, whereas the main stem and branches of *M. brevistyla* are often stiffly erect.

Figure 4. Flowering plants of *Moraea melanops* (*Goldblatt & Nänni 10249*). Scale bar 1 cm. Drawn by J. C. Manning.

Despite its being locally common and growing along a well-used hiking trail, *Moraea vigilans* appears to have been overlooked in the past. As far as we have been able to determine, the first collection of the species was made by the Denver horticulturist Panayoti Kelaidis in 1997. He drew our attention to the plant, and two years later we made the type collection.

Paratypes. SOUTH AFRICA. **Free State:** 2828 (Bethlehem) slopes of The Sentinel (DB), Jan. 1997, *Kelaidis s.n.* (MO).

4. Moraea melanops Goldblatt & J. C. Manning, sp. nov. TYPE: South Africa. Western Cape: Bredasdorp District, Fairfield Farm, 18 Aug. 1995, *Goldblatt & Nänni 10249* (holotype, NBG; isotypes, K, MO). Figure 4.

Plantae acaulescentes usque ad 4 cm altae, cormo glo-

boso 10–15 mm diametro, foliis obovatis usque oblanceolatis prostratis 20–35 × 10–14 mm marginibus undulatis, floribus in fasciculo laxo, spathis bracteisque foliaceis marginibus undulatis, floribus hypocrateriformibus purpureis in centro atropurpureis, tubo perianthii 18–27 mm longo cylindrico, tepalis patentibus vel leviter cupulatis obovatis ca. 16 × 9–10 mm, filamentis liberis vel infime connatis superne divergentibus, antheris ca. 3 mm longis, stylo erecto ca. 7 mm longo, antheris per ca. 1 mm superantibus, styli lobulis primo erectis cohaerentibus deinde supra antheras expansis.

Plants acaulescent, forming small tufts up to 4 cm high. *Corm* globose, asymmetric below, 10–15 mm diam., the tunics of cartilaginous layers, with age decaying into fibers arranged in herringbone pattern, or with hard vertical claw-like ribs separated by fine cross fibers, accumulating with age in a dense mass. *Cataphylls* membranous, persisting and accumulating with the remains of the past season's stems to form a fibrous neck around the underground part of the stem. *Leaves* not clearly distinguished from the floral bracts, only the lowermost inserted well below the ground shortly above the corm, this fairly short and inconspicuous, only two other leaves not associated with a flower, these inserted at ground level, the bases partly enclosing the inflorescence, the blades loosely prostrate, obovate to lanceolate, 20–35 × 10–14 mm, undulate, the margins occasionally crisped, especially on the proximal edges, leaves each subtending a flower, oblong or narrowly lanceolate, ± falcate and channeled, the margins usually crisped. *Inflorescence* a loose cluster of 2 to 5 flowers, each subtended by a leaf-like bract and a short sheathing bract; the floral bracts 22–24 mm long, pale and membranous in the lower half and the sheaths closed, broader above and green, obscurely bicarinate. *Flowers* hypocrateriform, light to dark purple, dark purple-black in the center; *perianth tube* cylindric, 18–27 mm long, ca. 1.8 mm wide, closed at the apex; *tepals* subequal, laxly spreading, obovate, ca. 16 × 9–10 mm. *Filaments* free or fused in the lower half, initially erect and contiguous, later diverging, ca. 3 mm long, yellow; *anthers* ca. 3 mm long, yellow, the pollen yellow. *Ovary* oblong-cylindric, ca. 4 mm long; *style* straight and erect, reaching ca. 1 mm beyond the anther apices, dividing into three short lobes, initially the lobes upright and appressed to one another, later becoming horizontal and lying just above the anthers. *Capsules* and *seeds* unknown.

Flowering mid August to early September.

Etymology. From the Greek *melanos*, "black" and *ops*, "eye," referring to the dark central pigmentation of the flower.

Distribution and biology. *Moraea melanops* is a rare endemic of the Caledon and Bredasdorp Districts of Western Cape Province, South Africa. The low-growing plants are inconspicuous and even in flower may be missed because of their close resemblance to co-blooming species of purple-flowered *Romulea rosea* (L.) Ecklon (Iridaceae), *Oxalis purpurea* L. (Oxalidaceae), and a species of *Drosera* (Droseraceae). It grows in heavy clay soil in renosterveld and flowers well only in disturbed sites where the vegetation has been burnt or heavily grazed so that the surrounding shrubby vegetation does not shade out the plants. The species may well be more common than is currently believed, but is so far known only from Fairfield Estate near Napier, Teslaarsdal, some distance west of Fairfield, and north of the Potberg, to the east. Plants of the latter collection are in fruit, so identification is provisional. Plants from the Teslaarsdal site, collected in 1976, were assigned to the related *M. barnardiella* Goldblatt (as *Galaxia barnardii* Goldblatt) by Goldblatt (1979). It seems reasonable to assume that *M. melanops* grows in similar habitats along the foot of the Klein River Mountain-Bredasdorp-Potberg axis. *Moraea barnardiella* is known only from Caledon and west and north of the town as far as Villiersdorp (Goldblatt, 1979, and later herbarium records).

The purple flowers with a dark center and spreading, rather than cupped, tepals recall particularly *Moraea barnardiella*, and it is to that species that *M. melanops* is most closely allied. Vegetatively, they appear to be identical and only the flowers differ. While *M. melanops* has free, slightly diverging filaments and the style exceeding the anthers and with fairly narrow lobes, *M. barnardiella* (Goldblatt, 1979) has the filaments free in the upper third and strongly diverging above, the style dividing opposite the middle of the anthers, and the style lobes themselves broader than in *M. melanops*.

Examination of living plants of this species has suggested to us an interpretation of the "inflorescence" in *Moraea* sect. *Galaxia*. Individual flowers are subtended by two foliar structures, a shorter inner and longer outer one, both with closed sheaths and inserted a short distance below the base of the ovary, i.e., at the base of a pedicel. The flower and these two foliar structures share a short stalk, a branch or peduncle (the distinction does not exist in subfamily Iridoideae). At the base of the branch/peduncle there is a scale-like membranous prophyll with two keels, exactly the organ one would expect at the base of a branch in the Iridaceae. This unit seems to us consistent with an interpretation that considers the flower and two associated foliar structures homologous with the branch and rhipidium, the inflorescence type of all

Iridoideae. The rhipidium is in this case single-flowered (a rhipidium is a type of monochasial cyme in which the inflorescence axis is collapsed, the flowers are thus borne in umbels, and the entire structure is laterally compressed and enclosed by opposed leaf-like bracts, the spathes). Single-flowered rhipidia are not common in the subfamily, but occur in depauperate plants in several genera, and are apomorphic in *Moraea cooperi* Baker (Goldblatt, 1986). The single flower on each of the branches of this species is subsessile and enclosed by opposed leathery spathes. The spathes are unequal, the inner one longer than the outer, and both are entirely sheathing. We suggest this is homologous with the pattern described for each flower in section *Galaxia*. In species of Iridoideae that have rhipidia with more than one flower, each additional flower is subtended by a membranous two-keeled bract. Thus we interpret the cluster of flowers borne at ground level in a basal rosette found in section *Galaxia* as a compound structure of two or more rhipidial inflorescences, each with a single flower, and arranged in umbellate fashion.

Paratypes. SOUTH AFRICA. **Western Cape:** 3419 (Caledon) 2 km E of Shaw's Pass on the road to Teslaarsdal (AD), 13 Sep. 1976, *Goldblatt 4093* (MO, NBG); 15 km NW of Napier, Fairfield Farm, poorly drained clay on gentle slope (BC), 27 July 1995, *Kemper IPC811* (NBG). 3420 (Bredasdorp) Potteberg North, recently burnt lower slopes (BC), 11 Oct. 1967 (fr), *Taylor 7198* (NBG).

Acknowledgments. We thank Neil MacGregor for hospitality and help in the field at Nieuwoudtville, Ingrid Nänni for help finding *Moraea melanops* on Fairfield Estate, Panayoti Kelaidis for drawing our attention to the existence of *M. vigilans*, and Roy Gereau for checking the Latin descriptions. Our fieldwork was funded by the National Geographic Society.

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Two New Species of *Begonia* (Begoniaceae) from the Atlantic Coastal Forest in the State of São Paulo, Brazil

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ABSTRACT. *Begonia salesopolensis* and *B. jureiensis*, known only from a montane forest in the state of São Paulo, Brazil, are described and illustrated. The former belongs to section *Ewaldia*, but it is distinguished from the other taxa of this section by its fleshy capsules with rudimentary or absent wings. The flattened style branches, obconical anthers, and the bilamellate placentae, ovuliferous throughout place *B. jureiensis* in section *Pereira*, and the peltate, glabrous leaf blades distinguish it from the other species of this section, *B. edmundoi* Brade.

RESUMO. *Begonia salesopolensis* e *B. jureiensis*, conhecidas apenas para a Serra do Mar no Estado de São Paulo, são descritas e ilustradas. A primeira distingue-se das demais espécies da Seção *Ewaldia* pelas cápsulas carnosas com alas rudimentares ou ausentes. Os ramos do estilete achatados e as anteras obcônicas enquadram *B. jureiensis* na seção *Pereira*, e suas folhas peltadas e glabras diferenciam-na da outra espécie desta seção, *B. edmundoi* Brade.

The genus *Begonia* is well represented in Brazil, especially in the Atlantic coastal forest. Smith et al. (1986) published two recent treatments of the genus, which attributed 240 taxa to Brazil, and included synonyms and a key for all species of *Begonia*. The floristic study of the genus in Atlantic forest in the state of São Paulo consisted of 40 taxa, 15 of which are endemic to São Paulo and 14 shared with Rio de Janeiro State (Gomes da Silva, 1998). During the preparation of this survey, we discovered two new species of *Begonia*, which are described below.

Begonia salesopolensis S. Gomes da Silva & Mamede, sp. nov. TYPE: Brazil. São Paulo: Mun. Salesópolis, Biological Station of Boracéia, 3 jun. 1992, *S. J. Gomes da Silva & E. P. Piacentin 307* (holotype, SP; isotypes, K, MO, RB, SPF, UEC). Figure 1A–I.

Herbae ad suffrutices glabri. Folia petiolo basifixo, laminae coriaceae, transverse ovalia, valde asymetricae. Flores albi, magni. Capsulae carnosae, coriaceae in sicco, alis nullis vel obsoletis.

Herbs to subshrubs, glabrous, 0.3–1.5(–1.8) m tall. Stems erect, internodes (1–)3–5.5(–8.1) cm long. Stipules tardily deciduous, ovate to obovate, erect, apex mucronulate, (2.3–)3–4.5 × (1.4–)2–3 cm; petioles terete, reddish, (4.5–)9–16.5(–21) cm long. Lamina basifixed, entire, transversely ovate, strongly asymmetric, (11.5–)15–24.5(–28) × (6–)7–12(–13.5) cm, palmatinervous, 6 to 10 primary veins, prominent on the upper surface, basal lobe rounded, (4.7–)6–9(–11) × (5.7–)7–11.5(–13.5) cm, margins undulate, apex acuminate, upper surface dark green, opaque, lower surface light green to wine-colored. Cymes 3 to 5(6) dichotomously branched, peduncles (12–)17–32(–36) cm long; bracts caducous, white to lightly pink, obovate, conduplicate, apex retuse, (1.1–)1.5–2(–3) × (0.6–)1–1.4(–1.8) cm. Staminate flowers: tepals 4, white, outer ones rounded-ovate to obovate, 15–25 × (5–)11–24 mm, inner ones obovate to oblong, (6–)10–17(–19) × (2–)3–6(–8) mm, stamens (25–)30 to 40(–45), anthers oblong, (1.8–)2–3(–3.5) mm, longitudinally ridged along dehiscence sutures, filaments free, (0.8–)1–1.5 mm, connective prominent, (0.3–)0.4–0.6 mm. Pistillate flowers: bracteoles 2, tardily caducous, white, ovate, apex retuse, (7–)10–12 × (5–)7–10(–14) mm; tepals 5, white, four ovate to obovate, (10–)14–23(–26) × (7–)10–18(–23) mm, the remaining one elliptic to obovate, 10–14(–19) × 5–6(–8) mm, hypanthium 7–7.5 mm long, ovary 6–6.5 mm long, placentae entire, style branches cylindrical, tortuous, stigma spirally band-shaped. Capsules globose, fleshy, strongly coriaceous when dried, (0.7–)0.9–1.1(–1.4) × (0.6–)0.8–1(–1.2) cm, wings absent or only rudimentary, unequal, the largest, if present, semilunate, (1–)3–4(–6) × (2–)4–6(–7) mm. Seeds cylindrical, minute.

Distribution. This species is known only from the type locality, Salesópolis Municipality, São Paulo, Brazil, between 700 and 900 m, growing in clearings in the forest where trees are shorter than usual.

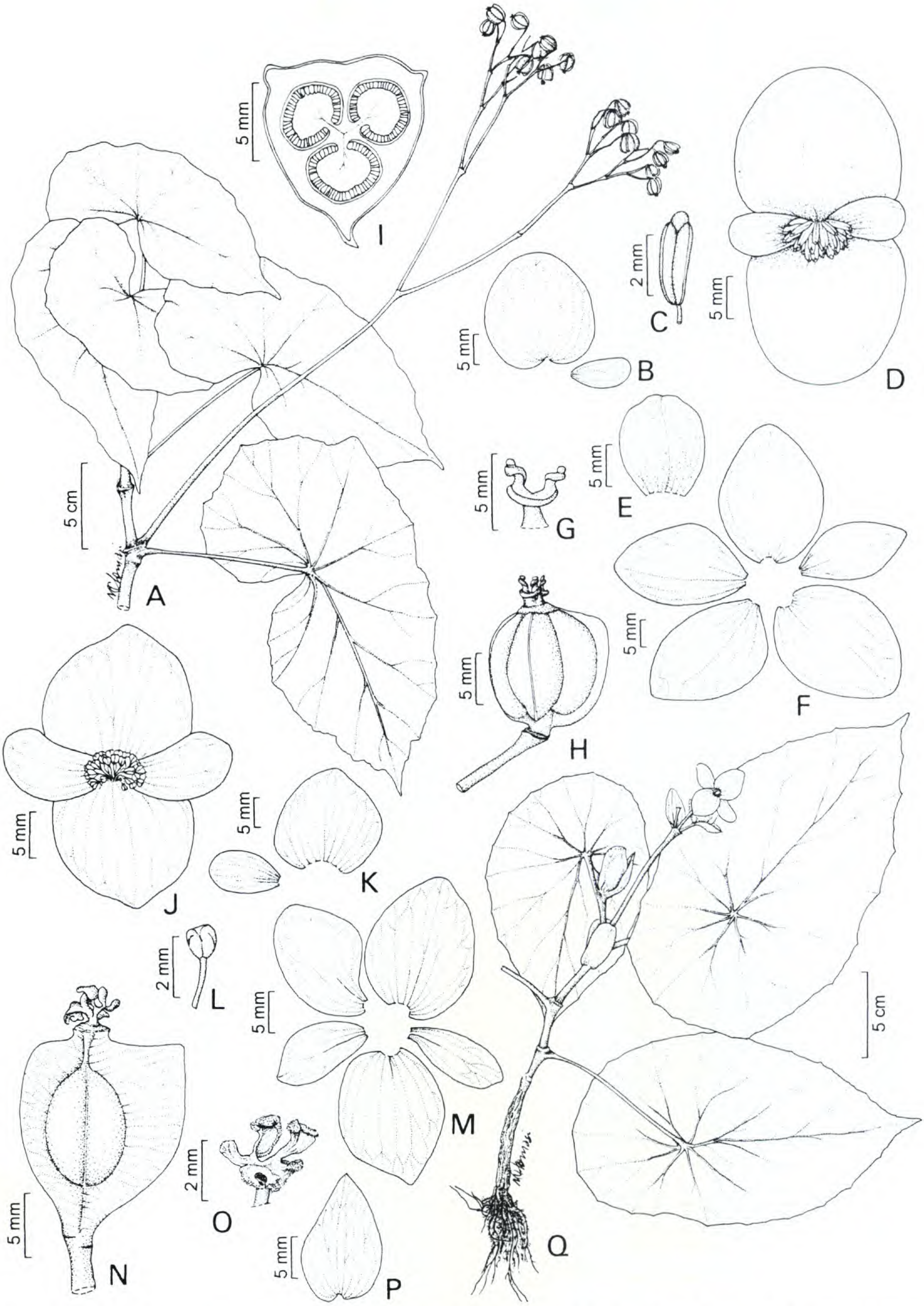

Figure 1. A–I. *Begonia salesopolensis* S. Gomes da Silva & Mamede. —A. Branch with fruits. —B. Outer and inner tepals of staminate flower, dorsal view. —C. Stamen. —D. Staminate flower. —E. Bract, ventral view. —F. Tepals of the pistillate flower, dorsal view. —G. Apex of the style. —H. Capsule. —I. Ovary in transverse section. J–Q. *Begonia jureiensis* S. Gomes da Silva & Mamede. —J. Staminate flower. —K. Outer and inner tepals of the staminate flower, dorsal view. —L. Stamen. —M. Tepals of the pistillate flower, dorsal view. —N. Gynoecium. —O. Apex of the style branch. —P. Bracteole of the pistillate flower, dorsal view. —Q. Habit. (A, from *Gomes da Silva & Piacentin 257;* B–I, from *Gomes da Silva & Piacentin 307;* J–P, from *Rossi et al. 563;* Q, from *Gomes da Silva et al. 189.*)

Phenology. Collected in flower from December to March, in fruit from December to July.

Etymology. The specific epithet alludes to the specific type locality (Salesópolis), a preserved area of Atlantic coastal forest in the southern part of São Paulo State, Brazil.

This species can be easily recognized by its almost wingless capsules with thick mesocarp, strongly coriaceous when dried, and by its large flowers up to 5 cm in diameter. The stigma spirally band-shaped, the leaf blades entire and palmately veined, and the shrubby habit place this species in section *Ewaldia.* It is morphologically most similar to *B. valdensium* A. DC. by its erect habit, leaf blade shape, number of stamens and anther shape, style branches, and tepals. However, *B. valdensium* differs in having a trichome ring on the petiole, proximal to blade, flowers up to 3 cm in diameter, and papery capsules with well-developed wings.

Paratypes. BRAZIL. **São Paulo:** Mun. Salesópolis, Biological Station of Boracéia, 15 Feb. 1950 (fl), *M. Kuhlmann 2330* (SP), 19 July 1957 (fr), *M. Kuhlmann 4216* (SP, SPF), 10 June 1959 (fl, fr), *O. Handro 864* (SP), 4 Mar. 1962 (fl), *O. P. Travassos 343* (RB), 16 Apr. 1964 (fl), *J. Mattos 11775* (SP), 24 Nov. 1983 (fr), *A. Custódio Filho 1919* (SP), 4 Jan. 1984 (fl), *A. Custódio Filho 2188* (SP), 6 Apr. 1984 (fl, fr), *A. Custódio Filho 2369* (SP), 13 Sep. 1984 (fr), *S. Romaniuc Neto & A. Custódio Filho 219* (SP), 4 Feb. 1988 (fl), *G. A. D. C. Franco & A. Custódio Filho 431* (SP, SPSF), 21 Mar. 1991 (fl, fr), *M. Kirizawa 2404* (SP), 24 Nov. 1991 (fr), *S. J. Gomes da Silva & E. P. Piacentin 257* (SP), 4 June 1992 (fl, fr), *S. J. Gomes da Silva & E. P. Piacentin 315* (SP), 5 Sep. 1994 (fl, fr), *R. T. Shirasuna et al. 31* (HRCB, SP, SPF).

Begonia jureiensis S. Gomes da Silva & Mamede, sp. nov. TYPE: Brazil. São Paulo: Mun. Iguape, Juréia-Itatins Ecological Station, 20 Feb. 1991 (fl), *S. J. Gomes da Silva, I. Cordeiro, L. Rossi, J. W. Godoi & S. A. Nicolau 189* (holotype, SP; isotype, UEC). Figure 1J–Q.

Herbae 30–50 cm altae, glabrae. Folia peltata; laminae ovales, laeviter asymetricae. Flores tepalis albis, glabris. Antherae obconicae. Rami styli laminares. Capsulae ignotae.

Herbs glabrous, 30–50 cm tall. Stems erect to prostrate but erect at branch apices, internodes (0.7–)3–3.5(–13.5) cm long. Stipules deciduous, ovate, apex mucronulate, ca. 3 × 1.5 cm; petioles glabrous, (6–)8.5–12.5(–17.5) cm long. Lamina glabrous, peltate, entire, ovate, slightly asymmetric, 18–23.5(–24.5) × (10–)11.5–14(–14.8) cm, palmatinervous, 7 to 8 primary veins, blade bases rounded, margins dentate, narrowing to acuminate at apices, upper surface green with white veins, lower surface green to purplish red. Cymes 1 or 2 dichotomously branched, peduncles (2–)3.5–7.5(–8) cm long; bracts caducous, white to lightly pink, ovate, apex mucronulate, 13–14 × 7–8 mm. Staminate flowers: tepals 4, white, glabrous, outer ones widely ovate, 17–21 × 18–19 mm, inner ones obovate, 10–17 × 5–7 mm, stamens ca. 30, anthers obconical, (0.7–)0.8–1.1 mm long, longitudinally ridged along dehiscence sutures, filaments free, 1.1–1.9 mm long, connective truncate. Pistillate flowers: bracteoles 2, persistent or deciduous, white, ovate, ca. 15 × 10 mm; tepals 5, white, glabrous, two ovate, ca. 16 × 13 mm, one obovate asymmetric, ca. 15 × 7 mm, two obovate to elliptic, ca. 12 × 5–6 mm, hypanthium ca. 11 mm long, ovary ca. 7.8 mm, placentae bilamellate, ovuliferous throughout, style branches flattened, almost kidney-shaped, stigma papillose along margins and apex. Capsules not seen.

Distribution. This species is known only from two collections, both from the type locality, where it is rare, growing on rocky slopes, at ca. 100 m.

Phenology. Collected in flower in February and March.

Etymology. The specific epithet alludes to the type locality (Juréia Mountains), a well-preserved area of Atlantic forest in the southern coast of São Paulo State, Brazil.

There are 14 Brazilian species of *Begonia* with peltate blades. In the state of São Paulo, only *B. paulensis* A. DC. shares this character; it differs from this new species by its hispid leaf blades and style branches cylindrical and spirally curled. Vegetatively, *B. jureiensis* resembles *B. pilgerana* Irmscher, an endemic species from Santa Catarina State, which is readily distinguished by its entire placentae, apex of petioles pubescent, staminate tepals pilose, and style branches bicornute. The flattened, kidney-shaped style branches found in *B. jureiensis* are not common within the genus, occurring in sections *Filicibegonia* (Africa), *Muscibegonia* and *Erminea* (Madagascar), and in the monotypic section *Pereira* (Brazil). The other species of this section, *B. edmundoi* Brade, is characterized by its large flowers and basifixed, pinnately veined leaves.

Paratype. BRAZIL. **São Paulo:** Mun. Iguape, Juréia-Itatins Ecological Station, 15 Mar. 1990 (fl), *L. Rossi et al. 563* (SP).

Acknowledgments. We thank Tarciso S. Filgueiras for help with the Latin diagnoses; Jefferson Prado for revision of the text; and Maria Cecília Tomasi for preparing the illustrations. We also thank the curators of the herbaria cited in the text. The fieldwork for this study was supported by a CNPq predoctoral

fellowship and in part by a grant from The John D. & Catherine T. MacArthur Foundation.

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Xanthosoma riparium (Araceae), a New Species from Goiás, Brazil

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ABSTRACT. A new species of a caulescent *Xanthosoma* (*X. riparium*) from Serra Dourada, state of Goiás, Brazil, is described and illustrated. *Xanthosoma riparium* is most similar to *X. mafaffoides* G. S. Bunting, *X. undipes* (Jacquin) Schott, and *X. maximilianii* Schott, but differs from all these species in having fewer primary lateral veins that arise at a more acute angle. Moreover, the primary lateral veins in *X. riparium* are close to each other near the sinus, becoming more scattered toward the apex, not regularly scattered along the midrib like in *X. mafaffoides*, *X. maximilianii*, and *X. undipes*. This new species appears to be the only caulescent *Xanthosoma* known to be native to central Brazil.

The genus *Xanthosoma* Schott ranges from Argentina to Mexico and the West Indies. Including about 60 species, it is the second largest neotropical genus within the subfamily Aroideae (classification after Mayo et al., 1997). It belongs to the tribe Caladieae Schott and shows a remarkable variability of life forms, ranging from caulescent perennial herbs to seasonally dormant tuberous plants. Some species of *Xanthosoma* have edible leaves or tubers, e.g., *X. sagittifolium* (L.) Schott and *X. violaceum* Schott. They are widely cultivated in the Neotropics (Plowman, 1969), as well as the Paleotropics (Quynh & Uyen, 1987; Okeke, 1992). Species of this genus usually occur as understory herbs in forests, along the margins of streams, in open marshy areas, or on the ground in deciduous or semi-deciduous forests, where they can be seen growing even in humus-filled limestone crevices. It has been presumed that the caulescent life form was primitive in the genus (Madison, 1981), and that the invasion of drier areas forced some species to evolve morphological and ecological adaptations like tuberosity and seasonally induced dormancy. The discovery of a caulescent *Xanthosoma* in the state of Goiás, central Brazil, is somewhat surprising because most caulescent species of this genus occur in Central America and northern South America. Since this *Xanthosoma* does not conform to any of the known caulescent species, it is described here as a new species.

Xanthosoma riparium E. G. Gonçalves, sp. nov. TYPE: Brazil. Goiás: Reserva Ecológica da Universidade Federal de Goiás em Serra Dourada, próximo à represa, 16°00′S, 50°07′W, 20 Jan. 1996, *E. G. Gonçalves 42* (holotype, UB; isotypes, K, MO). Figure 1.

Ad sectionem *Xanthosoma* pertinens. Planta riparia caudice fibrilloso epigaeo usque 51 cm longo. Vagina in fibras murinas soluta. Folia triangulari-sagittata vel ovato-sagittata, partim conduplicata. Nervi laterales primarii 4–5 (raro 6) angulo acuto (35–45°) et costa orientes, prope sinum approximati, remotescens versus apicem. Spathae tubus intus albus, extus viridis.

Herb caulescent, erect, up to 1.5 m tall, growing in clusters along stream banks, producing a milky latex when cut. Stem: thick, covered by old grayish shredded leaf sheaths, 20–51 × 3–7 cm. Leaf: *petiole* green, 58–61 × 1–2 cm, slightly flattened adaxially, sheathed for ⅓ to ½ of its length; *leaf blade* glossy green adaxially, paler semi-glossy abaxially, dried leaves greenish or ochre, becoming membranaceous, 42–53 × 19–30 cm, triangular-sagittate to ovate-sagittate, partially conduplicate in living plants; *anterior division* 29–33 × 19–30 cm, apex acuminate, acumen 0.5–1 cm long; *primary lateral veins* 4 to 5 (rarely 6) per side, diverging at 35–45° from midrib, close to each other near the sinus, becoming scattered toward the apex, collective vein 0.5–0.7 cm from the margin; *posterior divisions* 14–16 × 18–29 cm, lobes slightly extrorse, with rounded apex, basioscopic portion well developed, 3–4.5 cm wide, with 2 to 3 veins, acroscopic portion with 2 to 4 veins, sinus broadly parabolic, basal ribs denuded for 1–2.5 cm. Inflorescences: *peduncles* 2 to 3 per leaf axil, 12–20 × 0.8–1.0 cm; *spathe* constricted, 11.5–21 cm long, tube ovoid, 3–6 × 1.8–3 cm, green outside, white inside, lamina ovate, greenish white outside, white inside, 8.5–13 cm long; *spadix* 11–17 cm long, fertile male portion 8–13 × 0.5–1 cm, cylindrical, tapering to the apex, sterile male portion 2–3 × 0.4–0.7 cm, female portion bright yellow, basally adnate to spathe for ⅛ of the length, subsessile, stipe oblique up to 1 mm, 1.2–3 × 0.6–1 cm. Flowers: *synandrium* prismatic, 2–3 × 2 mm, 4- to 5-androus, thecae elongate, opening by an apical pore; *stam-*

Figure 1. *Xanthosoma riparium* E. G. Gonçalves. —A. Habit. —B. Inflorescence, spathe tube cut to show the female portion of the spadix. —C. Leaf blade. —D. Synandrium, side view. —E. Ovule. —F. Gynoecium, cross section. —G. Gynoecium, longitudinal section. —H. Infructescence. —I. Seed, side view. Drawn from *Gonçalves 42* by the author.

inodes irregularly shaped, upper ones much broader than lower; *gynoecium* prismatic, ca. 2 × 1 mm, style discoid, lobed stigma; *locules* 4, ovules many per locule, axially disposed, funiculus ½ the length of the ovule, lacking trichomes. Fruits: berries globose, cream or greenish white; *seeds* longitudinally striated, ovoid, ca. 1.5 × 1 mm.

Xanthosoma is poorly represented in central Brazil. All species previously reported as native from this region are seasonally dormant plants from the section *Acontias* Engler (*X. striatipes* (Kunth) Madison, *X. helleborifolium* (Jacquin) Schott, *X. platylobum* (Schott) Engler, *X. plowmanii* Bogner, and *X. pentaphyllum* Engler), with all of these acaulescent and tuberous. This may be due to the pronounced dry season from May to August, which may eliminate most of the mesophytic caulescent species from understory habitats. *Xanthosoma riparium*, with its caulescent habit, may have persisted because of its adaptation to a semi-aquatic environment. The new species occurs in small clusters of 2 to 3 adult stems and some young propagules on rocky banks along streams. Growing on riverbanks, the plant has access to water, even during the drier months of the year. It is noteworthy that the area where *X. riparium* was collected has a slightly high-

er average rainfall (1600–1800 mm/year) when compared to the surrounding region, which receives around 1400–1600 mm/year (Assad, 1994). Interestingly, the type locality is very near the "Araguaia" Pleistocenic forest refuge proposed by Prance (1982). One can speculate that the caulescent species of *Xanthosoma* were widespread in most of South America during warmer and humid periods, and they were eliminated (or became restricted to smaller areas) when the climate became more seasonal.

Xanthosoma riparium seems to have been overlooked for a long time. There is a specimen collected by M. A. Weddell (s.n.) in 1844 that can certainly be referred to this species. It was autographed by Engler as "*Xanthosoma spec.*," but he did not describe it as new. The species was recollected by H. S. Irwin et al. in 1966 and again by me in 1996.

Xanthosoma riparium belongs to the section *Xanthosoma* Engler (formerly known as sect. "*Euxanthosoma*" Engler). This species is most similar to *X. mafaffoides* G. S. Bunting, a caulescent species known only from southern Venezuela. However, the primary basal veins in *X. riparium* are close to each other near the sinus, becoming more scattered toward the apex. In *X. mafaffoides*, the primary lateral veins are regularly scattered along the midrib (see illustration in Bunting, 1988). Moreover, *X. riparium* has fewer primary lateral veins (up to 5 or rarely 6, instead of 7–8), and these veins arise at a sharper angle (ca. 35–45° instead of 55–65°).

Xanthosoma riparium also shares some resemblance with *X. maximilianii* Schott, from Bahia (eastern Brazil), but differs in having the outer surface of the spathe tube green (instead of purplish sea-green), never purple-red inside, spathe lamina without red margins, and partially conduplicate leaves. The primary lateral veins in *X. maximilianii* are regularly scattered along the midrib, unlike *X. riparium*. I have also observed in living plants that *X. maximilianii* has brownish, shredded old leaf sheaths in the stem, whereas they are grayish in *X. riparium*. Some depauperate forms of *X. undipes* (Jacquin) Schott can also be confused with *X. riparium*, mainly those growing in disturbed areas under full sunlight. However, all material of *X. undipes* I have so far observed has primary lateral veins regularly scattered along the midrib and a purple inner portion of the spathe (not white as in *X. riparium*).

Paratypes. BRAZIL. **Goiás:** 1844 *Weddell s.n.* (P); Serra Dourada, ca. 30 km SE of Goiás Velho, elev. 700 m, 21 Jan. 1966, *Irwin, Souza & Santos 11915* (SP, UB not seen).

Acknowledgments. I thank Tarciso S. Filgueiras, George Eiten, Thomas B. Croat, and Simon J. Mayo for helpful suggestions on the manuscript. I am also grateful to the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for financial support during this work.

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Nomenclatural Changes in the Genus *Mimosa* (Fabaceae, Mimosoideae) in Southern Mexico and Central America

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ABSTRACT. As a result of a taxonomic study of the genus *Mimosa* L. for *Flora de Nicaragua*, *Flora Mesoamericana*, and *Flora de México*, six new combinations at the infraspecific level, two new names at the specific level, and two changes of series category at the supraspecific level, are herein proposed. These taxa occur mainly in southeastern Mexico (states of Veracruz, Tabasco, Oaxaca, Chiapas, and the Yucatán Península) as well as in Central America.

RESUMEN. Como uno de los resultados del estudio taxonómico del género *Mimosa* L. para la *Flora de Nicaragua*, la *Flora Mesoamericana* y la *Flora de México*, se proponen seis combinaciones nuevas a nivel infraespecífico, dos nombres nuevos a nivel específico, así como dos cambios en la categoría de serie a nivel supraespecífico, para los taxa existentes principalmente en el sureste de México (estados de Veracruz, Tabasco, Oaxaca, Chiapas y la Península de Yucatán) así como en Centroamérica.

The genus *Mimosa* is characterized by biparipinnate leaves; haplostemonous or diplostemonous flowers, these disposed in capitate or spicate inflorescences; and articulate or unarticulate legumes with persistent margins. It comprises 480 to 500 species, of which 90% are American with the rest distributed in Africa and Asia. Most of the diversity is found in the tropics as well as in arid and semi-arid regions at elevations from sea level up to 2250 m. Several species grow in temperate areas at 2000–2750 m (Grether, 1978; Lewis & Elias, 1981; Barneby, 1991).

A taxonomic treatment of the genus for *Flora Mesoamericana* included 47 species with 28 varieties (Grether, 1997). In Nicaragua, 19 (40%) of these species have been found. Mexico is considered the second distributional center of the genus after Brazil: 100 to 110 species are known to occur in the country, and about 60% of them are endemic to different regions of it (Grether & Martínez-Bernal, 1996). According to Barneby (1991), the genus in the New World comprises five sections: *Mimadenia*, *Habbasia*, *Batocaulon*, *Calothamnos*, and *Mimosa*; each of these includes series. Section *Mimosa* has been divided into three series, and series *Mimosa* into 37 subseries.

The aim of this paper is to formalize and validate new combinations, new names, synonymies, and lectotypifications at the series, species, and variety level to accompany the taxonomic treatment of *Mimosa* in *Flora de Nicaragua*, *Flora Mesoamericana*, and *Flora de México*.

1. Series **Acantholobae** Barneby

Series *Acantholobae* is characterized by shrubby or arboreous species with lanceolate-oblong, oblong, or elliptic legumes, these 1–2.5 cm wide and with entire valves; the inflorescences are capitate or spicate. The group mainly occurs in Mexico and Central America, although *Mimosa acantholoba* (Humboldt & Bonpland ex Willdenow) Poiret var. *acantholoba* extends to Ecuador and Peru.

Barneby (1991) considered series *Acantholobae* to comprise five varieties of *M. acantholoba*. Within this species, he accepted variation of inflorescences from globose to subglobose capitula or spikes and variation of legumes from lanceolate-oblong to oblong or elliptic, with valves glabrous, setose, or echinate. However, he described *M. seticuspis* as a distinct species.

Within series *Acantholobae*, the following new combinations are proposed:

Mimosa acantholoba (Humboldt & Bonpland ex Willdenow) Poiret var. **seticuspis** (Barneby) R. Grether, comb. et stat. nov. Basionym: *Mimosa seticuspis* Barneby, Mem. New York Bot. Gard. 65: 109. 1991. TYPE: El Salvador. Depto. Santa Ana: 15 km W of Metapan on low-lying ground N of Lago de Guija, 22 Feb. 1989, *C. E. Hughes 1256* (holotype, NY; isotype, MEXU).

In my opinion, this taxon should be treated at the infraspecific level because of its capitate inflorescences. The main difference with *Mimosa acantholoba* var. *acantholoba* is the narrower legume,

always glabrous, with margins unarmed or slightly prickly, and the apex usually rostrate with the rostrum up to 1.1 cm long. *Mimosa acantholoba* var. *seticuspis* was earlier known only from type specimens, but it has subsequently been found in the Isthmus of Tehuantepec, particularly in the regions of San Miguel Chimapala and La Ventosa, near sea level, in the state of Oaxaca, Mexico. Because of its flowers disposed in subglobose capitula, this variety parallels *M. acantholoba* var. *molinarum*, from which it is distinguished by its longer and narrower lanceolate-oblong fruits, and by its narrowly oblong leaflets.

Mimosa acantholoba is characterized by its glabrous to puberulent flowers disposed in capitula; I recognize four varieties: *M. acantholoba* var. *acantholoba*, variety *eurycarpa* (B. L. Robinson) Barneby, variety *molinarum* Barneby, and variety *seticuspis* (Barneby) R. Grether. I regard variety *liesneri* Barneby as better placed under *Mimosa platycarpa* Bentham, herein recognized at the specific rank; it is distinguished from *M. acantholoba* by its always puberulent flowers disposed in spikes.

Mimosa platycarpa Bentham var. **liesneri** (Barneby) R. Grether, comb. nov. Basionym: *Mimosa acantholoba* var. *liesneri* Barneby, Mem. New York Bot. Gard. 65: 108. 1991. TYPE: Costa Rica. Guanacaste: Santa Rosa National Park, 2 km N of headquarters on road past Lagoona, 1 Feb. 1978, *R. Liesner 4800* (holotype, NY; isotypes, CR, MO).

Species and varieties of series *Acantholobae* can be distinguished by the following key:

1a. Flowers in dense capitula, 8–15 mm diam . . . . . *M. acantholoba*
2a. Flowers in globose to subglobose capitula, 8–10 mm diam.; legumes with valves glabrous to shortly setose or echinate, 1.5–2.5 cm wide.
3a. Legumes 5–8 cm long with valves glabrous to shortly setose; pinnae 4 to 12 pairs; leaflets 10 to 20 pairs; Mexico, Nicaragua, Ecuador, and Peru . . . . . *M. acantholoba* var. *acantholoba*
3b. Legumes 3.5–5.5 cm long with valves always echinate in the middle; pinnae 6 to 8 pairs; leaflets 15 to 30 pairs; Mexico (Oaxaca) . . . . . *M. acantholoba* var. *eurycarpa*
2b. Flowers only in subglobose capitula, 12–15 mm diam.; legumes with valves always glabrous, 1–1.7 cm wide.
4a. Legumes oblong to elliptic, 4–4.5 × 1.3–1.7 cm; leaflets obliquely linear-oblong, (9)12 to 22 pairs; pinnae (2)4 to 8 pairs; Honduras . . . . . *M. acantholoba* var. *molinarum*
4b. Legumes lanceolate-oblong, 6–8 × 1–1.1 cm; leaflets obliquely, narrowly oblong, (14)17 to 26 pairs; pinnae (4)5 to 11 pairs; Mexico (Oaxaca) and El Salvador . . . . . *M. acantholoba* var. *seticuspis*
1b. Flowers in lax spikes, 2–4 cm long . . *M. platycarpa*
5a. Legumes lanceolate-oblong to oblong or elliptic, 3–8 × 1–2.5 cm, valves glabrous with prominent venation; pinnae 4 to 10 pairs; leaflets obliquely linear-oblong, 8 to 20(26) pairs; Mexico (Oaxaca and Chiapas), Guatemala, Honduras, Nicaragua, and Costa Rica . . . . . *M. platycarpa* var. *platycarpa*
5b. Legumes always lanceolate-oblong, 4.5–6.5 × 1–1.4 cm, valves largely setose without prominent venation; pinnae (2)3 to 6(8) pairs; leaflets obliquely linear, (8)10 to 15(17) pairs; Costa Rica . . . . . *M. platycarpa* var. *liesneri*

2. Series **Glanduliferae** Bentham

Series *Glanduliferae* comprises 12 species occurring mainly in South America; *Mimosa watsonii* B. L. Robinson is the only species of this group found in southern Mexico and Central America besides *M. guilandinae* (DC.) Barneby var. *paterata* Barneby, which ranges from Colombia to Costa Rica.

Grether (1987), based on consistent inflorescence, flower, fruit, and leaflet characters, included *Mimosa recordii* Britton & Rose, *M. resinifera* Britton, and *M. rekoana* Britton in the synonymy of *M. watsonii*, mentioning the great variation in the number of pinnae and leaflets.

Barneby (1991) considered it useful to recognize the extreme variations in size and number of leaflets and pinnae at the varietal level, distinguishing variety *watsonii* by its leaves with 2 to 3 pairs of pinnae and 2 to 4 pairs of leaflets, the distal pair of them (3–)4–11 × 2.5–6.5 cm, and variety *recordii* by its leaves with 4 to 7 pairs of pinnae and 5 to 9 pairs of leaflets, the distal pair 1.5–3 × 0.8–2 cm. He reported a discontinuous distribution range for variety *watsonii* in Oaxaca and Veracruz, Mexico, southeast Guatemala, and northwest Honduras, while variety *recordii* was known from Belize, southern and central Guatemala, and from Chiapas and Oaxaca in Mexico.

Based on examination of material from the entire distributional range of this species, including the state of Guerrero in Mexico, El Salvador, Nicaragua, and Costa Rica, I consider it impossible to delimit infraspecific taxa. The leaves vary from 2 pairs of pinnae with 1 to 3 pairs of leaflets, as in the type of *M. watsonii*, to 2 to 3 pairs of pinnae with 2 to 5 pairs of leaflets or 2 to 4 pairs of pinnae with 4 to 7 pairs of leaflets, all the way up to 5 to

6 pairs of pinnae with 4 to 9 pairs of leaflets. Variation is also observed in size of leaflets, 2.5–12 × 1.5–6 cm; intermediate combinations are frequent.

Additionally, analysis of geographical distribution range, altitudinal range, and vegetation types where this species occurs, as well as flowering and fruiting time, do not allow one to delimit varieties. Therefore, I include *M. watsonii* B. L. Robinson var. *recordii* (Britton & Rose) Barneby in the synonymy of this species.

3. Series **Lactifluae** (Barneby) R. Grether

I propose to treat this group of section *Mimosa* at the rank of series:

Mimosa Series **Lactifluae** (Barneby) R. Grether, stat. nov. Basionym: Series *Mimosa*, subseries *Lactifluae* Barneby, Mem. New York Bot. Gard. 65: 571. 1991. TYPE: *Mimosa lactiflua* Delile ex Bentham.

The groups Xantiae, Psilocarpae, Michelianae, and Chaetocarpae (nom. nud.) were included in the key for the genus, but not formally named as series by Britton and Rose (1928). Barneby (1991) elected to recognize none of these.

The *Lactifluae* are mainly a Mexican group, extending to the province of Guanacaste in Costa Rica. The greatest diversity of species is found in the Isthmus of Tehuantepec in the state of Oaxaca, Mexico, where the following taxa are frequent: *Mimosa deamii* B. L. Robinson (endemic to that region), *M. goldmanii* B. L. Robinson and *M. lactiflua* Delile ex Bentham (states of Puebla, Morelos, Guerrero, and Oaxaca), *M. melli* Britton & Rose and *M. psilocarpa* B. L. Robinson (states of Oaxaca and Chiapas), and *M. tricephala* Chamisso & Schlechtendal (wide distribution from Baja California, along the Sierra Madre Occidental (Sinaloa to Chiapas), central Mexico and the state of Veracruz, extending to Guatemala, Honduras, and Costa Rica). Other species endemic to Mexico are *M. sicyocarpa* B. L. Robinson (Sinaloa to Michoacán) and *M. caerulea* Rose (states of México and Morelos).

In my opinion, the *Lactifluae* must be treated at the rank of series, considering that they form a well-delimited group because of their habit, mainly shrubby or arboreous, and their morphology, as well as by their geographical distribution range.

Within this series, several new synonyms and new combinations, which are part of a Master's thesis on the Xantiae group and allied species by Teresa Chehaibar, are proposed here.

On the basis of examination of type collections and many other specimens from Mexico, Grether (1987) concluded that *Mimosa mixtecana* Brandegee is a synonym of *M. lactiflua* Delile ex Bentham. However, Barneby (1991) considered it in the synonymy of *M. caerulea* Rose. After reexamination of type specimens and material from Mexico, including the type locality of *Mimosa mixtecana*, Chehaibar and I confirm that it is a synonym of *Mimosa lactiflua* and not of *M. caerulea*. The latter is distinguished by its leaves with 1 to 2 pairs of pinnae and 5 to 12(14) pairs of leaflets, obliquely linear-oblong to lanceolate, as well as by its herbaceous or suffruticose habit.

Mimosa tricephala Chamisso & Schlechtendal var. **lignosa** (Micheli) Chehaibar & R. Grether, comb. et stat. nov. Basionym: *Mimosa lignosa* Micheli, Mém. Soc. Phys. Genève 34(3): 278. 1903. TYPE: Mexico. Michoacán [or Guerrero]: Las Higueritas, July 1898, *Langlassé 232* (holotype, G not seen; isotypes, F, MEXU, US).

Mimosa lignosa Micheli had been considered a synonym of *M. nelsonii* B. L. Robinson (Britton & Rose, 1928); however, Barneby (1991) segregated it as taxon B in the key to the members of the *M. xanti* complex. Chehaibar and I have examined the isotypes, the original description, and illustration of *M. lignosa*, as well as recent flowering and fruiting collections from the state of Michoacán. Based on that material, we agree with Barneby in considering this to be a distinct taxon; nevertheless, we place it at the infraspecific level. *Mimosa tricephala* var. *lignosa* is distinguished from *M. tricephala* var. *nelsonii* (vide infra) by its completely glabrous leaflets with prominent reticulate venation, smaller floral bracts and calyx, and by pubescent, not setose, legumes. It is endemic to the Balsas Basin in the state of Michoacán, Mexico.

Mimosa tricephala var. **nelsonii** (B. L. Robinson) Chehaibar & R. Grether, comb. et stat. nov. Basionym: *Mimosa nelsonii* B. L. Robinson, Proc. Amer. Acad. Arts 33: 314. 1898. TYPE: Mexico. Oaxaca: between San Gerónimo and La Venta, 13 July 1895, *E. W. Nelson 2775* (lectotype, selected here, GH; isolectotype, US).

Mimosa nelsonii B. L. Robinson was based on two syntypes: *Nelson 2775*, a flowering specimen from Oaxaca, Mexico, and *Palmer 88*, a fruiting specimen from Guerrero, Mexico. However, Barneby (1991) mistakenly cited the specimen collected by Nelson as holotype and the Palmer specimen as paratype of this taxon. *Nelson 2775* is selected here as lectotype of this taxon, which pre-

serves current use; moreover, the Palmer collection is *M. tricephala* var. *xanti*, because of its fruits with valves and margin strigose to hispid and pubescent.

Mimosa tricephala var. *nelsonii* is distinguished from the other three varieties mainly by its legumes with valves and margin pubescent, densely and shortly setose, with rigid and erect setae 1–2 mm long.

Mimosa tricephala var. **xanti** (A. Gray) Chehaibar & R. Grether, comb. et stat. nov. Basionym: *Mimosa xanti* A. Gray, Proc. Amer. Acad. Arts 5: 157. 1862. TYPE: Mexico. Baja California: Cabo San Lucas, Aug. 1859–Jan. 1860, *L. J. Xantus 29* (holotype, GH; isotypes, K, NY, US).

Mimosa zacapana Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 57. 1944. Syn. nov. TYPE: Guatemala. Zacapa: rocky slopes near Santa Rosalía, 4 Oct. 1939, *J. A. Steyermark 29018* (holotype, F).

Examination of the type specimen and collection of a topotype of *M. zacapana* Standley & Steyermark (*R. Grether et al. 2294*, UAMIZ) led Chehaibar and me to conclude it should be synonymized here.

Barneby (1991) treated *Mimosa xanti* A. Gray as a species different from *M. tricephala* Chamisso & Schlechtendal. He tentatively recognized taxa A, B, C, and D in a key to the members of the *Mimosa xanti* complex, including *M. xanti*, *M. conzattii* Britton & Rose, *M. lagunensis* M. E. Jones, *M. langlassei* Micheli, *M. guanacastensis* Standley, and *M. nelsonii* within taxon A, and excluding *M. margaritae* Rose. The latter was considered as a distinct species, resembling in foliage *M. caerulea*, even though it is based on a vegetative specimen from Isla Margarita, Baja California Sur in Mexico.

Herein, taxon A is named at the varietal level as *Mimosa tricephala* var. *xanti*, excluding *M. guanacastensis*, *M. nelsonii*, and *M. margaritae*. It is distinguished from the typical variety mainly by its legumes with valves and margin strigose to hispid and pubescent.

Mimosa guanacastensis was described by Standley as endemic to the province of Guanacaste in Costa Rica without placement in any series of the genus. Examination of type collections as well as numerous flowering and fruiting specimens from Mexico and Costa Rica led Chehaibar and me to conclude that *M. guanacastensis* is also conspecific with *M. tricephala*. Because of their legumes with valves and margin densely and largely hirsute, with yellow, not rigid setae, Chehaibar and I include both *M. guanacastensis* and *M. chaetocarpa* in the synonymy of *M. tricephala* var. *tricephala*.

Varieties of *Mimosa tricephala* can be distinguished by the following key:

1a. Legumes with valves and margin hirsute or setose; floral bracts ½–⅔ of corolla length; stipules pubescent.
  2a. Legumes with valves and margin densely and largely hirsute, with setae 2–4 mm, not rigid; leaflets 10 to 15 pairs; Mexico (Veracruz, Puebla, and Morelos) and Costa Rica . . . . . *M. tricephala* var. *tricephala*
  2b. Legumes with valves and margin densely and shortly setose, with setae 1 mm or less, rigid and erect, mixed with fine trichomes; leaflets 4 to 8 pairs; Mexico (Michoacán and Oaxaca) . . . . . *M. tricephala* var. *nelsonii*
1b. Legumes with valves and margin strigose to hispid and pubescent or only pubescent; floral bracts ⅕–⅓ of corolla length; stipules glabrous or hispid.
  3a. Legumes with valves and margin strigose to hispid and pubescent; floral bracts ⅓–½ of corolla length; calyx ¼ of corolla length; stipules hispid; Mexico (Baja California Sur, Michoacán, Guerrero, Oaxaca, and Chiapas), Guatemala, and Honduras . . . . . *M. tricephala* var. *xanti*
  3b. Legumes with valves and margin only pubescent; floral bracts ⅕–⅓ of corolla length; calyx $\frac{1}{10}$–⅛ of corolla length; stipules glabrous; Mexico (Michoacán) . . . . . *M. tricephala* var. *lignosa*

4. Series **Leiocarpae** Bentham

I accept the synonymy of series *Leiocarpae* Bentham as given by Barneby (1991: 119), and to that synonymy I would add series *Distachyae* Britton & Rose ex Barneby, Mem. New York Bot. Gard. 65: 67. 1991. Syn. nov.

Bentham (1875) described series *Leptostachyae*, including all the species known till then, with diplostemonous flowers disposed in spikes and with articulate legumes. Within the *Leptostachyae*, Bentham distinguished four informal, unnamed groups: the first one was comprised of unarmed species, with lepidote or tomentose-stellate indumentum, among them, *M. schomburgkii* Bentham; the second group included species also unarmed, but pubescent to tomentose and never canescent to glabrous, among others, *M. puberula* Bentham; the third group included prickly and tomentose-vellose species, such as *M. guatemalensis* (Hooker & J. D. Arnold) Bentham; and the fourth one, included species also prickly, but glabrous to scarcely pubescent, among them, *M. adenantheroides* (M. Martens & Galeotti) Bentham, *M. arenosa* (Willdenow) Poiret, and *M. tenuiflora* (Willdenow) Poiret.

Barneby (1991: 119) abandoned the name series

Leptostachyae because it is a nomen illegitimum—Bentham included within it the types of two other prior series. Barneby (1991: 67–68) distributed the species of Bentham's series *Leptostachyae* into series *Leiocarpae* and series *Distachyae*; Barneby (1991: 68) pointed out that "It must be admitted that there are not very cogent technical reasons for segregating discrete series from series *Leptostachyae* sensu lato . . .." The *Distachyae* have predominantly 5-merous flowers and leaves with 1 to 30 pairs of pinnae, each pinna with 1 to 25 pairs of leaflets. The series is primarily Mexican, with one species extending to the Caribbean lowlands of Colombia and Venezuela (*Mimosa distachya* Cavanilles). By contrast, Barneby viewed the *Leiocarpae* as comprising species with flowers predominantly 4-merous and leaves with more than four pairs of pinnae, the leaflets more than 10 per pinna. The series is mostly South American, with only three species extending to Central America and Mexico (*Mimosa schomburgkii*, *M. arenosa*, and *M. tenuiflora*).

Obviously, as Barneby acknowledged, delimitation of series *Leiocarpae* and *Distachyae* is not clear. A detailed analysis of number of pinnae and leaflets of the 27 species included in the *Leiocarpae* demonstrated a variation of 1–38 pairs of pinnae and of 5–70 pairs of leaflets per pinna, although only four species have 42–70 pairs of leaflets per pinna. Moreover, within the *Distachyae*, the Mexican species *Mimosa costenya* McVaugh with 8–12 pairs of pinnae and 17–25 pairs of leaflets and *M. benthamii* J. F. Macbride with 8–30 pairs of pinnae and 12–25 pairs of leaflets bridge the gap between the two series.

Mimosa schomburgkii (*Leiocarpae*) and *M. benthamii* (*Distachyae*) have both tetra- and pentamerous flowers, even in the same spike, as do other Mexican species of *Distachyae*, such as *M. guatemalensis*, *M. xochipalensis* R. Grether, *M. luisana* Brandegee, and *M. dysocarpa* Bentham, the latter occurring also in the southern United States. I disagree with Barneby (1991) and consider that this group of species, characterized by their diplostemonous flowers, these disposed in spikes, with articulate legumes and shrubby or arboreous habit, should be maintained as a single series, even though diversification at the specific level has been noteworthy both in Mexico and in South America.

5. Series **Mimosa**

Within this group, the following new combination is proposed:

Mimosa velloziana Martius var. **maxonii** (Standley) R. Grether, comb. et stat. nov. Basionym: *Mimosa maxonii* Standley, Contr. U.S. Natl. Herb. 17: 432. 1914. TYPE: Guatemala. Vicinity of Mazatenango, 20 Feb. 1905, *W. R. Maxon & R. Hay 3497* (holotype, US; photo and fragments, NY ex US).

Mimosa maxonii was described by Standley, who mentioned its close relationship with *M. velloziana* Martius. The original description indicates pentamerous flowers; nevertheless, the type specimen as well as additional material examined have tetramerous flowers, as do those of *M. velloziana*. The main observed differences, with respect to typical *M. velloziana*, are the fruits with puberulent valves, the puberulent corolla lobes, and the always sessile, puberulent ovary. I conclude that this merits recognition as a variety of *M. velloziana*; Barneby (1991: 541) commented, "*Mimosa maxonii* represents a relatively uncommon variant with pod-valves densely puberulent." The species as a whole is a widespread opportunistic weed. *Mimosa velloziana* var. *maxonii*, however, is endemic to Mesoamerica and known from Deptos. Mazatenango and Zacapa in Guatemala as well as from Mpios. Mapastepec, Acacoyagua, and Tapachula, Chiapas, in Mexico.

Mimosa velloziana var. *maxonii* can be distinguished from the typical variety by the following key:

1a. Legumes with valves glabrous and venation prominent, 0.8–1.5 cm wide, apex apiculate to mucronate; calyx 1/6–1/5 of corolla length; corolla glabrous; leaflets obliquely lanceolate to narrowly elliptic, sometimes slightly falcate; Mexico (Nayarit, Veracruz, Oaxaca, Tabasco, and Chiapas), Guatemala, Costa Rica, Panama, Colombia, Brazil, and northern Argentina . . . . . *M. velloziana* var. *velloziana*

1b. Legumes with valves densely puberulent, without prominent venation, 0.7–0.9 cm wide, apex acute to apiculate; calyx 1/10–1/8 of corolla length; corolla lobes puberulent; leaflets obliquely lanceolate to lanceolate-oblong, never falcate; Mexico (Chiapas) and Guatemala . . . *M. velloziana* var. *maxonii*

6. Series **Quadrivalves** Barneby

Species previously included in the genus *Schrankia* Willdenow form a very distinct group. Barneby (1991) transferred them to *Mimosa*, and established series *Quadrivalves*, including the whole genus *Schrankia*, which had been maintained apart from *Mimosa* because of its tetragonal, unarticulate legumes; the fruits are apparently tetragonal, because the margin is as wide as or wider than the valves, in most cases.

The genus *Mimosa* encompasses a wide variation in legume form, often used to distinguish series within the sections. In this way, series *Acanthocarpae* and *Acantholobae* present legumes with entire valves and a thin margin, while in other series, such as *Pachycarpae*, legumes with entire valves and conspicuously wide margins are found, as in species of series *Quadrivalves*. Further, several taxa of *Quadrivalves*, such as *Mimosa quadrivalvis* L. var. *platycarpa* (A. Gray) Barneby, have legumes with valves wider than the margin, resembling those of *M. diplotricha* C. Wright ex Sauvalle of series *Paucifoliatae*, although the latter are articulate.

On this basis, I agree with Barneby (1991) in treating *Schrankia* as a series of *Mimosa*, while I disagree with the incorporation of all known taxa of this former genus as varieties of a single species. *Mimosa candollei*, *M. robusta*, and *M. tetragona* are morphologically and geographically well delimited. In addition, *M. hystricina* (Small ex Britton & Rose) B. L. Turner from Texas, is easily distinguished by its leaves with 5 pairs of pinnae and 11 pairs of leaflets per pinna; prickly, very long peduncles (9–12 cm) and small legumes (2.5–4 cm), densely setose, with valves 5 mm wide and margin 2–2.5 mm wide.

Turner (1994a, 1994b, 1995) recognized at the species level eight other varieties of *Mimosa quadrivalvis*, sensu Barneby; these occur in Texas and Mexico.

Series *Quadrivalves* still requires a biosystematic study or at least, more and better collections and field observations to delimit several taxa with precision, and to determine its relationships within *Mimosa*.

The following new names and synonymy are proposed within this series:

Mimosa candollei R. Grether, nom. nov. Replaced name: *Mimosa quadrivalvis* L. var. *leptocarpa* (DC.) Barneby, Mem. New York Bot. Gard. 65: 298. 1991. *Schrankia leptocarpa* DC., Prodr. 2: 443. 1825. *Leptoglottis leptocarpa* (DC.) Standley, J. Wash. Acad. Sci. 15: 458. 1925; non *Mimosa leptocarpa* Rose, Contr. U.S. Natl. Herb. 1: 326. 1895. TYPE: Santo Domingo, *Poiteau s.n.* (holotype, G-DC not seen, microfiche IDC: 800–12. 416: III. 3).

This species was originally described under *Schrankia*, from Santo Domingo; De Candolle (1825) characterized it by its tetragonal branches, leaves with 2–3 pairs of pinnae, numerous pairs of leaflets, straight, subulate, largely acuminate legumes, 10 times as long as the peduncle, solitary or geminate heads, as well as prickly branches and petioles. In 1925, it was transferred to the genus *Leptoglottis* by Standley; it was considered as a variety of *Mimosa quadrivalvis* L. by Barneby (1991).

This taxon differs from *M. quadrivalvis* sensu stricto by its longer petioles, up to 5(–8) cm, slightly longer and wider leaflets, up to 10 × 3 mm, shorter and puberulent peduncles, up to 1.5 cm, longer legume, up to 9(–12) cm, with less thickened margin, 2–3.5 mm wide, and apex largely rostrate, the rostrum 0.6–2 cm. The range of *M. quadrivalvis* L. var. *quadrivalvis*, sensu Barneby (1991), is restricted to the state of Veracruz in Mexico, while *M. quadrivalvis* L. var. *leptocarpa* (DC.) Barneby ranges from Brazil and Bolivia to the states of Tabasco and Chiapas in Mexico. In my opinion, the latter merits recognition at the specific level. The name *Mimosa candollei* honors A. P. De Candolle for his important contributions to the taxonomy of *Mimosa* and other Mimosoideae.

Mimosa robusta R. Grether, nom. nov. Replaced name: *Mimosa quadrivalvis* L. var. *distachya* (DC.) Barneby, Mem. New York Bot. Gard. 65: 295. 1991. *Schrankia distachya* DC., Prodr. 2: 443. 1825. *Leptoglottis distachya* (DC.) Britton & Rose, N. Amer. Fl. 23: 141. 1928; non *Mimosa distachya* Cavanilles, Icon. 3: 48, t. 295. 1795. TYPE: [Mexico]: (fl. mex. ic. ined.) . . . in Nova Hispania. (holotype, sheet 6331.560 in Icones of Sessé & Mociño (as *Mimosa intsia*), Hunt Library).

Schrankia palmeri (Britton & Rose) Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 8: 14. 1930. Basionym: *Leptoglottis palmeri* Britton & Rose, N. Amer. Fl. 23: 143. 1928. TYPE: Mexico. Jalisco: Guadalajara, July–Oct. 1886, *E. Palmer 267* (holotype, NY; isotype, US).

My study of *Mimosa quadrivalvis*, sensu Barneby (1991), in order to determine material from Mesoamerica, drew my attention to *M. quadrivalvis* L. var. *distachya* (DC.) Barneby. This is a very common taxon on the Pacific slope and in the Sierra Madre Occidental, from Sinaloa to Oaxaca in Mexico. Among members of series *Quadrivalves*, I consider it is a species distinct from *M. quadrivalvis*, because of its robust branches, large leaves, very dense capitula, 1.5–2 cm in diameter, and legume densely prickly with recurved prickles and margin wider than the valves. On the basis of these characters, I propose the new name, *Mimosa robusta* R. Grether, for this species.

I agree with McVaugh (1987) in reducing

Schrankia palmeri (Britton & Rose) Standley to the synonymy of this species.

Mimosa tetragona Poiret, in Lamarck, Encycl. Méth. Bot. Suppl. 1: 56. 1810. *Mimosa quadrivalvis* L. var. *tetragona* (Poiret) Barneby, Mem. New York Bot. Gard. 65: 297. 1991. *Schrankia hamata* Humboldt & Bonpland ex Willdenow, Sp. Pl. 4: 1042. 1806. *Leptoglottis hamata* (Humboldt & Bonpland ex Willdenow) Standley, J. Wash. Acad. Sci. 15: 458. 1925; non *Mimosa hamata* Willdenow, Sp. Pl. 4: 1033. 1806. TYPE: "Habitat in America meridionali," *Humboldt & Bonpland 4800* (holotype, B-W not seen, microfiche IDC: 7440. 1385: I. 4).

This species was originally described as *Schrankia hamata* Humboldt & Bonpland ex Willdenow, and transferred to the genus *Leptoglottis* by Standley in 1925. However, Poiret had in 1810 transferred it to *Mimosa*, assigning a new name, *M. tetragona*, due to the existence of a different species named *M. hamata* Willdenow, occurring in India. Despite Poiret's transfer, material of this taxon had commonly been placed in *Schrankia*. Woodson and Schery (1950) cited *S. hamata* for Panama; they included *M. tetragona* Poiret and *Leptoglottis hamata* (Humboldt & Bonpland ex Willdenow) Standley in the synonymy.

Barneby (1991) treated this taxon at the varietal level, as *M. quadrivalvis* L. var. *tetragona* (Poiret) Barneby. I agree with Poiret and consider this taxon a distinct species whose correct name at specific rank is *Mimosa tetragona*.

The latter three species can be distinguished from *Mimosa quadrivalvis* L. by the following key:

1a. Peduncles 1.5–3.5 cm long; capitula 1–2 cm diam.; apex of legumes acute to apiculate.
  2a. Petiole 2–3.5 cm long; pinnae 1 to 3 pairs; leaflets 8 to 11 pairs, glabrous, with one prominent eccentric vein on the lower surface; stipules 2–3 mm long, lanceolate to ovate; legumes 4–5 cm long, 6 mm wide, glabrous, margin 4–5 mm wide; Mexico (Veracruz) . . . . . *M. quadrivalvis*
  2b. Petiole 7–11 cm long; pinnae 3 to 5 pairs; leaflets 12 to 17 pairs, puberulent, glabrescent, with prominent reticulate venation on the lower surface; stipules 6–10 mm long, filiform; legumes 7–12 cm long, 4–5 mm wide, with pilose, glabrescent margin 3–3.5 mm wide; Mexico (Sinaloa, Nayarit, Jalisco, Guerrero, and Oaxaca) . . . . . *M. robusta*
1b. Peduncles 0.5–1.5 cm long; capitula 0.5–1.2 cm diam.; apex of legumes rostrate, the rostrum 6–15 mm long.
  3a. Pinnae 1 to 3 pairs; leaflets with one prominent eccentric vein on the lower surface; stipules narrowly lanceolate; branches and peduncles sparsely prickly; legumes glabrous, sparsely prickly to unarmed, 3–4 mm wide; Antilles, Mexico (Tabasco and Chiapas), Belize, Nicaragua, Costa Rica, Colombia, Venezuela, Brazil, and Bolivia . . . . . *M. candollei*
  3b. Pinnae 2 to 4 pairs; leaflets with delicately reticulate venation on the lower surface; stipules filiform; branches and peduncles densely prickly; legumes pubescent, densely prickly, 5–6 mm wide; Cuba, Nicaragua, Panama, Colombia, and Ecuador . . . . . *M. tetragona*

7. Series **Setosae** Barneby

This is a group of eight species mostly distributed in Brazil, Paraguay, and Bolivia. Only *Mimosa setosa* Bentham subsp. *paludosa* (Bentham) Barneby var. *paludosa* occurs in Mexico as well as in Brazil and Paraguay.

A new synonym of this taxon is proposed here:

Mimosa occidentalis Britton & Rose var. *novogaliciana* Barneby, Mem. New York Bot. Gard. 65: 478. 1991. Syn. nov. TYPE: Mexico. Jalisco: Mpio. La Huerta, Cerro Huehuentón, 20–25 km al E de Chamela, 27 Aug. 1976, *J. Rzedowski & R. McVaugh 1370* (holotype, MICH not seen).

My study of *Mimosa occidentalis* Britton & Rose for *Flora Mesoamericana* included *Mimosa occidentalis* var. *novogaliciana* Barneby. The latter was originally described from the state of Jalisco and is also known from the state of Nayarit in Mexico. A paratype from Nayarit (3 mi. NE de Puga, *C. Feddema 875*, MEXU, NY) has glandular trichomes and large, subglobose capitula, corresponding to *Mimosa setosa* subsp. *paludosa* var. *paludosa*. This taxon is also found in the states of México and Guerrero in Mexico (Grether & Martínez-Bernal, 1996) and occurs in Brazil and Paraguay. With variety *novogaliciana* reduced to the synonymy of an otherwise South American plant, there remains no infraspecific taxon within *M. occidentalis*, which is a very distinct species occurring in Mexico and Belize.

8. Series **Teledactylae** (Barneby) Britton & Rose ex R. Grether

I propose the rank of series for the treatment of this group of section *Mimosa*:

Mimosa Series **Teledactylae** (Barneby) Britton & Rose ex R. Grether, stat. nov. Basionym: series *Mimosa* subseries *Teledactylae* Barneby, Mem. New York Bot. Gard. 65: 532. 1991. TYPE: *Mimosa teledactyla* Donnell Smith.

This group was established as a monotypic subseries of series *Mimosa* by Barneby (1991), who

resurrected the name Teledactylae (nom. nud.), which was included in the key for groups within the genus by Britton and Rose (1928).

It is important to point out that Standley and Steyermark described *Mimosa canahuensis* in 1944 and included it in the *Flora of Guatemala* (Standley & Steyermark, 1946), where they mentioned that this species is known only from the type locality. There are no more recent collections from Guatemala. They did not relate this species to *M. teledactyla*, even though they also included the latter in the *Flora of Guatemala*. This is due to their description of the legumes of *M. canahuensis* with entire valves and flowers not seen. They concluded that its affinities are uncertain and that it is not related to any other species known from Guatemala.

Barneby (1991) listed *Mimosa canahuensis* Standley & Steyermark in Appendix I, Nomina incertae sedis vel nuda, stating: "Not known to me and, since the flower and androecium were not described, of doubtful systematic status. The leaf-formula of IV–VI/7–11 suggests *M. teledactyla*, but leaflets (14–19 × 5–8 mm) are much too large, and the pod-valves said to fall entire, are not compatible with that species. The habit and armament of recurved prickles suggest *M. ervendbergii*, the pod *M. ceratonia*."

However, detailed examination of the holotype of *Mimosa canahuensis* (*J. A. Steyermark 43758*, F) demonstrated there are tetramerous, haplostemonous flowers remaining in fruiting capitula. I consider it to be closely related to *M. teledactyla* by its legumes which, indeed, are articulate, with valves and margin setose, by its striate branches with prickles along the striae, by its petiole and primary and secondary rachis prickly, as well as by its prickly peduncles and tetramerous, haplostemonous flowers.

This is the first record of *M. teledactyla* in Mexico (Chiapas: Mpio. Jitotol, 12 km SE de Pueblo Nuevo Solistahuacán, *M. Sousa et al. 12810*, MEXU, MO, NY).

I conclude that by incorporating *Mimosa canahuensis*, this group is now well delimited within section *Mimosa* by its leaves with 3–6 pairs of pinnae, well separated from each other, by the petiole and rachis armed with yellow, recurved prickles, prickly peduncles, and branches pubescent and hispidulous or densely hirsute. On this basis, I propose the rank of series for this group.

Species of this series can be distinguished by the following key:

1a. Leaflets obliquely elliptic to widely oblong; branches pubescent and hispidulous; peduncles 1.5–2.5 cm long, puberulent; petiole puberulent; stipules 2.5–3 mm; calyx ⅕–¼ of corolla length; legumes with valves and margin largely setose; Guatemala . . . . . *M. canahuensis*

1b. Leaflets obliquely oblong; branches densely hirsute; peduncles 3–4 cm long, hirsute; petiole sparsely setose; stipules 5–10 mm; calyx ⅙ of corolla length; legumes with valves and margin setose; Mexico (Chiapas), Guatemala, and Honduras . . . . . *M. teledactyla*

Acknowledgments. I wish to express my appreciation to Mario Sousa, Instituto de Biología, UNAM, for his critical review of the manuscript and careful advice during the taxonomic study of *Mimosa* in Mesoamerica. This paper is part of the Ph.D. thesis of Rosaura Grether, and new combinations and synonymies in series *Lactifluae* are part of the Master's thesis of Teresa Chehaibar. Research was supported in part by Consejo Nacional de Ciencia y Tecnología, Grant D112-903774, and by Dirección General de Investigación Científica y Superación Académica, Secretaría de Educación Pública, Grant C90-01-0282. Special thanks are given to Victoria C. Hollowell, Missouri Botanical Garden, and Neil A. Harriman, University of Wisconsin-Oshkosh, for critical comment improving the manuscript.

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Notes on the Correct Nomenclature of *Silene stewartii* S. A. Ghazanfar (Caryophyllaceae)

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ABSTRACT. During the preparation of a checklist of endemic taxa of Caryophyllaceae on the Indian subcontinent, the need for a nomenclatural correction of the following taxon became evident. Based on types, protologues, and herbarium (CAL, DD) specimens, *Silene stewartii* (Edgeworth) Majumdar is morphologically distinct from *Silene stewartii* S. A. Ghazanfar. The nomenclature of *Silene stewartii* S. A. Ghazanfar is corrected by establishing the new name *Silene subodhii* S. R. Kundu.

A new species of *Silene*, *S. stewartii* S. A. Ghazanfar, was published in 1982 based on material reported from the Pirpanjal range in Kashmir, northwest Himalaya (Ghazanfar, 1982; Ghazanfar & Nasir, 1986). The 1982 publication overlooked a note on a new combination of *Silene stewartii* (Majumdar, 1974) based on specimens reported from Lahul in Kashmir and Chamba of Himachal Pradesh (Majumdar, 1974, 1993).

Silene stewartii (Edgeworth) Majumdar, in Bull. Bot. Surv. India 16: 155. 1974. *Lychnis stewartii* Edgeworth, in Fl. Brit. India 1: 224. 1874. *Silene chambensis* Majumdar, in J. Indian Bot. Soc. 42: 649. 1963(1964).

Diagnostic features of *Silene stewartii* (Edgeworth) Majumdar bear little resemblance to *Silene stewartii* S. A. Ghazanfar (see Table 1). Furthermore, both taxa are described based on different type material. Hence, the later homonym *Silene stewartii* S. A. Ghazanfar (1982) is illegitimate, as the specific epithet is unavailable by its use as *S. stewartii* (Edgeworth) Majumdar in 1974, according to Article 53.1 of the *Code* (Greuter et al., 1994). A new binomial is proposed here, following Articles 7.3 and 33.2 of the *Code*.

Silene subodhii S. R. Kundu, nom. nov. Replaced name: *Silene stewartii* S. A. Ghazanfar, in Pakistan J. Bot. 14(2): 115. 1982. Not Majumdar, in Bull. Bot. Surv. India 16: 155. 1974. TYPE: Kashmir. Pir Panjal range, Fras Nag, ±9000, 4.8 1947, *R. R. & I. D. Stewart 23244* (holotype, RAW; isotype, NY).

The new specific epithet is given in honor of the author's father, Mr. Subodh Ranjan Kundu.

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Table 1. Comparative morphological features of *S. stewartii* and *S. subodhii*.

Silene stewartii	*Silene subodhii*
1. Slender, grass-like herb	1. Short, woody herb
2. Stems 15–25 cm long	2. Stems 7–15 cm long
3. Leaves narrow, linear to lanceolate, 25–55 × 1.5–2 mm	3. Leaves dimorphic: a. basal leaves (leaves on main trunk) spathulate or oblong-lanceolate, 25–35 × 7–10 mm b. apical leaves (leaves on branches): linear-lanceolate, 18–25 × 5–6 mm
4. Calyx oblong-clavate, 8–9 mm long	4. Calyx campanulate, 10–11 mm
5. Petals ca. 7 × 2 mm	5. Petals ca. 8 × 1 mm
6. No. of styles: 3	6. No. of styles: 5
7. Seeds tuberculate, ca. 1.3 mm	7. Seeds papillate, ca. 1 mm

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A New, Threatened Species of *Tetraplasandra* (Araliaceae) from Kaua'i, Hawaiian Islands, and Notes on its Conservation Status

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ABSTRACT. *Tetraplasandra flynnii* is described from Kaua'i, Hawaiian Islands. It resembles the more widespread *T. kavaiensis*, but is restricted to a single known population now comprising only three individuals growing in mesic to wet forest that is increasingly impacted by introduced goats and aggressive non-native plant species. Material has been propagated for ex situ conservation, but effective management will be required to ensure the continued survival of the wild population.

The remarkable flora of the Hawaiian Islands has received renewed attention from field botanists and taxonomists since the mid 1980s, stimulated by the *Manual of the Flowering Plants of Hawai'i* project (Wagner et al., 1990). In addition to carrying out a comprehensive re-assessment of species limits and distributions within Hawai'i, the project also served as a catalyst for exploration, especially in areas that had previously been neglected. Botanically, Kaua'i is perhaps the least well known of Hawai'i's eight main islands, and its highly dissected topography, with many deep valleys and steep, often vertical slopes, presents special challenges for plant collecting. Recent fieldwork aimed at documenting the island's flora has generated many interesting collections, including several new species, one of which is described here.

The continued survival of wild populations of many native Hawaiian endemics is increasingly threatened because of extensive habitat degradation or loss. For this reason, the National Tropical Botanical Garden (NTBG) has placed special emphasis on assessing the geographic distribution of the most restricted and vulnerable of these endemic species, and on studying their population structure and genetics so that appropriate measures can be undertaken using both in situ and ex situ conservation techniques. Our new species of *Tetraplasandra* is one of these very rare single-island endemics, and we hope that by describing it here and detailing the current plight of the only known population, we can stimulate action by those in a position to implement effective protection.

Tetraplasandra flynnii Lowry & K. R. Wood, sp. nov. TYPE: U.S.A. Hawaiian Islands. Kaua'i: Waimea Dist., Koke'e State Park, Kalalau Valley, steep forested slope of SE rim, ca. 1175 m, 22°09′N, 159°38′W, 17 Aug. 1988 (fl, fr), *Flynn 3103* (holotype, PTBG (1871, 1872); isotypes, BISH, F, K, MO (3595738, 3595740, 4629226), P, US (2 sheets)). Figures 1–3.

Haec species *T. kavaiensi* affinis, sed ab ea reproductionis systemate andromonoico, ovario 5-carpellari omnino infero, petalis majoribus 8.0–12.5 mm longis atque fructu urceolato majore 15–18 × 10–12 mm metiente in columnam stylarem conicam desinente differt.

Andromonoecious trees ca. 7–9 m tall, well branched above the middle. Leaves pinnately compound, 28–57 cm long, densely rusty brown to tawny farinose stellate pubescent throughout except on the upper surface of the leaflets; petiole 7–17 cm long, stout, ca. 4–8(–10) mm diam. at the base; rachis articulated at the petiolule bases; petiolules of lateral leaflets (2–)5–22 mm long, those of the terminal leaflet (17–)20–50 mm long; leaflets 5 to 9, narrowly ovate to elliptic, 4–8 × (5.5–)7–17 cm, the lowermost pair sometimes reduced, lamina glossy green and glabrous above, often with a whitish scurf, midvein yellow-green, farinose stellate pubescent below with evident yellow-brown venation, apex acute to nearly rounded, margin entire, minutely revolute, base acute to rounded or subcordate, usually oblique on the lateral leaflets. Inflorescence axillary, paniculate-umbellate, pendent, densely brown farinose stellate pubescent throughout, primary axis stout, (5–)6–13 cm long, secondary axes (2–)3–6, 2–4 terminal and (0–)1–2 inserted laterally along the primary axis, the uppermost secondary axes (peduncles) 6–10 cm long, bearing ca. 10 to 15 hermaphrodite flowers, ca. 3 to 8 forming a terminal umbellule and the others scattered along the axis, the lowermost generally abortive and leaving an evident scar, the lower secondary axes (when present) sometimes further divided, 13–15 cm long, with 10

Figure 1. *Tetraplasandra flynnii* Lowry & K. R. Wood. —A. Branch with buds, flowers, and young fruits. —B. Detail of ultimate inflorescence branch with buds and flowers. —C. Mature fruits. —D. Stamens. Drawn from *Flynn 3103*.

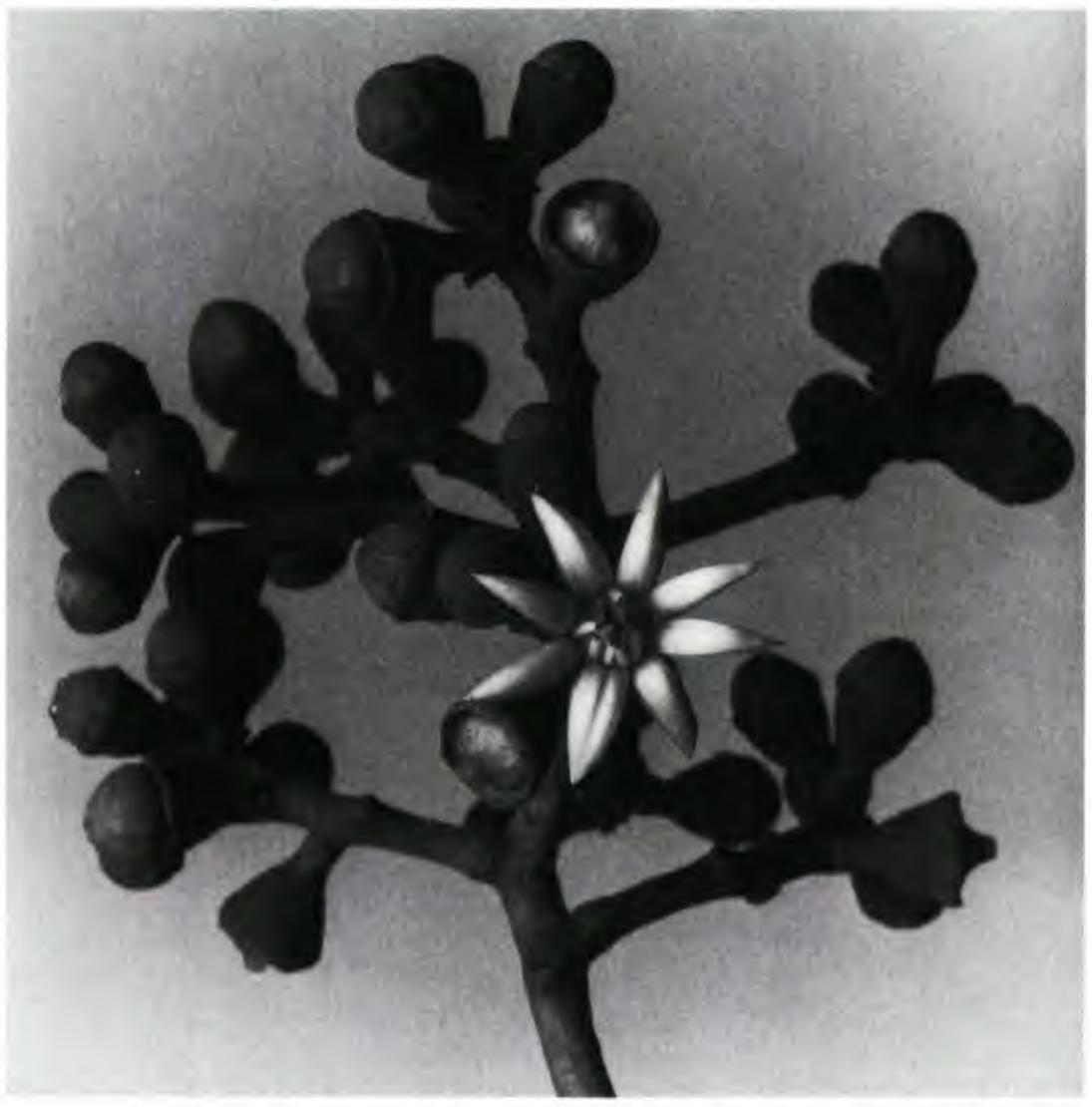

Figure 2. *Tetraplasandra flynnii.*—Branch with buds and open flower. Photograph of *Wood 7156;* courtesy of D. Liittschwager & S. Middleton.

Figure 3. *Tetraplasandra flynnii.*—Nearly mature fruit. Photograph of *Wood 7156*; courtesy of D. Liittschwager & S. Middleton.

to 12 tertiary axes (peduncles) bearing ca. 7 to 15 apparently staminate flowers, 3 to 6 forming a terminal umbellule and the others borne mostly in the distal half, many early abortive and leaving an evident scar, pedicels stout, 2–7 mm long, ca. 3–4 mm diam. in hermaphrodite flowers, ca. 2 mm diam. in staminate flowers. Calyx cupuliform, shallow, ca. 1 mm high at anthesis, expanding to ca. 2 mm in fruit, irregularly undulate. Corolla depressed-rounded to broadly obtuse or nearly triangular in bud, petals 10 (or 11), sometimes remaining united in pairs at anthesis and appearing fewer in number, lanceolate-triangular, yellow-green, fleshy, coriaceous when dry, densely farinose stellate pubescent on the dorsal surface, glabrous within, in hermaphrodite flowers 5–6 mm long in bud expanding to 8–12.5 mm at anthesis, smaller in staminate flowers, up to 4–5 mm at anthesis. Stamens 10 (or 11), in hermaphrodite flowers the filaments thick, ca. 4 mm long, the anthers 3–3.5 mm long, in staminate flowers the filaments 2–2.5 mm long, the anthers 2.5 mm long. Ovary 5-carpellate, fully inferior, obconic in bud, becoming somewhat urceolate at anthesis, especially in hermaphrodite flowers, surmounted by a concave nectar disk tapering into a stout column of 5 fused styles, ca. 1–2 mm long at anthesis, expanding to 4 mm in fruit, crowned by 5 sessile stigmas. Mature fruit urceolate, 15–20 mm high, 10–16 mm wide near the middle, 10–12(–16) mm wide distally, with a distinctly expanded calyx rim; nearly mature seeds tan-brown, ovate to elliptic-compressed, broader at base, 11 × 7 mm.

This species is named in honor of Timothy Flynn, Curator of the Herbarium at NTBG, who collected the type material, and who has contributed so much to our knowledge of the rich and highly endemic flora of Kaua'i through nearly two decades of active fieldwork in some of the island's most difficult terrain.

Paratypes. U.S.A. HAWAIIAN ISLANDS. **Kaua'i:** Hanalei Dist., Koke'e State Park, Kalalau Valley, ca. 1060 m, 18 Aug. 1986 (fl, fr), *Flynn & Montgomery 1868* (MO, PTBG [2]); steep forested slope of SE rim, ca. 1175 m, 17 Aug. 1988 (bud, fl, & fr), *Flynn & Hume 3103A* (PTBG [2]), (fl, fr), *Flynn & Hume 3104* (MO [2], PTBG [2]); Hanalei Dist., Na Pali-Kona Forest Reserve, steep SW slope between Kalalau and Puu O Kila lookouts, 1160–1250 m, 9 Nov. 1988 (bud, fl), *Flynn et al. 3210* (PTBG); Kalalau Valley, just below and N of new sanctuary & Kahuama'a Flats, steep N-facing *Metrosideros* montane mesic to wet forest, ca. 1180 m, 10 June 1998 (bud, fl, fr), *Wood & Perlman 7361* (BISH, MO, PTBG), 23 July 1998, (bud, fl, fr), *Wood & Aguraiuja 7403* (PTBG), (bud, fl, fr), *Wood & Aguraiuja 7404* (MO, PTBG); ca. 1170 m, 28 July 1998 (bud, fl, fr), *Wood & Aguraiuja 7405* (BISH, MO, P, PTBG, US); ca. 1180 m, 31 Aug. 1998 (bud, fl, fr), *Wood 7456* (BISH, MO, PTBG).

Distribution and ecology. *Tetraplasandra flynnii* is extremely rare, known from only a single population covering ca. 1 km^2 in the Kalalau Valley of Kaua'i, Hawai'i. Collections have been made in Koke'e State Park, within the Na Pali-Kona Forest Reserve, and between the first and second Kalalau lookouts. The new species occurs on a steep north-facing montane mesic to wet 'ohi'a forest (dominated by *Metrosideros polymorpha* Gaudichaud-Beaupré), with a mostly open canopy that is approximately 10–15 m tall. Other associated tree species include *Xylosma hawaiiense* Seemann, *Psy-*

chotria greenwelliae Fosberg, *Pritchardia minor* Beccari, *Pleomele aurea* (H. Mann) N. E. Brown, and *Dodonaea viscosa* Jacquin. Another Araliaceae endemic to Kaua'i, *Tetraplasandra waialealae* Rock, occurs sympatrically with *T. flynnii*, but is more widespread and does not appear to be threatened. Understory shrubs growing in the vicinity of the new species include *Styphelia tameiameiae* (Chamisso & Schlechtendal) F. Mueller, *Melicope feddei* (H. Léveillé) T. G. Hartley & B. C. Stone, and *Exocarpus luteolus* C. N. Forbes. *Carex meyenii* Nees, a native sedge, is also common. Terrestrial ferns include *Diplazium sandwicianum* (Presl) Diels and *Odontosoria chinensis* (L.) J. Small.

Affinities. *Tetraplasandra flynnii* most closely resembles *T. kavaiensis* ('ohe'ohe), which likewise occurs on Kaua'i but is also found elsewhere in the Hawaiian archipelago. The genus *Tetraplasandra* comprises seven species (including the new one described here), all of which are endemic to Hawai'i. It forms part of a closely related group that also includes *Gastonia* (ca. 8 to 10 species from Madagascar, the Seychelles and Mascarene Islands, Malesia, and the Solomon Islands), *Munroidendron* (1 species endemic to Kaua'i), and *Reynoldsia* (5 species, 1 each in Hawai'i, the Marquesas, and the Society Islands, and 2 in Samoa). As pointed out by Philipson (1970; see also Lowry, 1987, 1990), these genera are difficult to separate, and limits between them can only be recognized using a combination of morphological characters coupled with geographic distribution, suggesting that they may well represent a single genus. However, until more detailed studies, including phylogenetic analyses using both morphological and molecular data, can be completed, it seems best to place our new species in *Tetraplasandra* along with its closest relatives.

A key to the species of *Tetraplasandra* was provided in the treatment of Araliaceae for the *Manual of the Flowering Plants of Hawai'i* (Lowry, 1990; see also Lowry, 1987), to which the following couplet should be added to facilitate identification of material of *T. flynnii*.

4a. Plants with hermaphrodite flowers only, petals 5–7 mm long at anthesis, ovary appearing (¼–)⅓–¾ inferior, 2- to 5-carpellate, fruit globose-ovoid to ovoid or cylindrical, 10–15 mm high, 8–11 mm wide, calyx rim a narrow ridge or line, borne near the middle of the fruit, disk expanded, rounded to conical, without an evident stylar column . . . . . *T. kavaiensis* (H. Mann) Sherff

4b. Plants andromonoecious, with both hermaphrodite and staminate flowers, petals of hermaphrodite flowers 8–12.5 mm at anthesis, ovary fully inferior, 5-carpellate, fruit urceolate, 15–18 mm high, 10–12 mm wide, calyx rim expanded, borne at the top of the fruit, disk concave, surmounted by a conical stylar column . . . . . *T. flynnii* Lowry & K. R. Wood

Threats and conservation status. The 'ohi'a forest where *Tetraplasandra flynnii* occurs is being severely impacted as a result of constant browsing by goats (Wood & Perlman, 1993). During field observations made by the second author in June 1998, only three individuals of *T. flynnii* were found, a striking decrease from the approximately nine plants seen in the area prior to Hurricane Iniki, which struck Kaua'i in 1992. In August 1999 one of these last remaining trees was purposefully girdled by an unidentified visitor to this remote area. An attempt is being made to graft bark material from an individual of *T. kavaiensis*, but it is unlikely that the tree will survive.

All three individuals known of *T. flynnii* occur within 200 m of one another. Survey work conducted in August 1998 in adjacent forest of similar structure and composition situated just to the east failed to reveal any other individuals of *T. flynnii*. Kaua'i has been reasonably well explored botanically, but there is still a small chance that other trees might remain in several isolated regions that have not yet been visited by botanists.

No regeneration of native tree species appeared to be occurring in the area where *Tetraplasandra flynnii* grows. Only four native understory species were found to be reproducing: *Cyrtandra paludosa* Gaudichaud-Beaupré, *Scaevola procera* Hillebrand, *Lysimachia kalalauensis* Skottsberg, and *Korthalsella platycaula* (Tieghem) Engler. As the older trees die, increased erosion on the precipitous ridges in the Kalalau Valley will continue, threatening the remnant native forest where *T. flynnii* occurs. Although no non-native trees were observed in the immediate area, a number of invasive alien species occur nearby, e.g., at Kahuama'a Flat, including *Corynocarpus laevigatus* J. R. Forster & G. Forster and *Myrica faya* Aiton. These aggressive trees have not yet spread onto the slopes where *T. flynnii* grows, but they present a serious risk. Several very invasive alien herbaceous weeds are, however, already displacing the forest understory in and around the immediate habitat of *T. flynnii*, most notably *Erigeron karvinskianus* DC., which blankets large sections of the region and tends to smother native species. *Kalanchoe pinnata* (Lamarck) Persoon is also a dominant weed in the Kalalau Valley, along with *Rubus argutus* Link, *Holcus lanatus* L., *Bromus rigidus* Roth, and *Setaria gracilis* Kunth.

Tetraplasandra flynnii is one of 116 species of Hawaiian plants currently included in the Genetic Safety Net group. This status applies to endemic species represented by no more than 50 naturally occurring individuals. As *T. flynnii* is presently known from only three individuals, staff members at both the NTBG and the University of Hawai'i's micro-propagation lab at Lyon Arboretum on O'ahu

have made propagation of this species a priority project. Material collected from all three plants has been successfully propagated using in vitro tissue culture techniques. Seedlings are now growing in cultivation, thereby assuring the short-term genetic conservation of *T. flynnii*. Reintroduction using these seedlings will be attempted in the near future at the Kalalau Plant Sanctuary, located about 300 m from the tree from which the type material of *T. flynnii* was collected.

The continued survival of what appears to be the last remaining population of *Tetraplasandra flynnii* will, however, depend on adequate conservation management in the Kalalau Valley. Implementation of control measures aimed at reducing or eliminating populations of feral ungulates and invasive alien weeds might permit the reintroduction of native keystone tree species during the wet season. Protection of the Kalalau Valley ecosystem is further justified because it contains two fragmented areas representing the last vestiges of Kaua'i's imperiled diverse mesic forest ecosystem, as well as an important transitional zone between mesic and wet forest communities. This transitional habitat appears to be restricted to the Kalalau Valley, and is especially rich, with several other new species documented from the region in recent years (Wood & Perlman, 1993), including *Hibiscadelphus woodii* Lorence & W. L. Wagner, *Dubautia kenwoodii* G. Carr, and *Lysimachia scopulensis* K. Marr, among others.

Several forested areas occurring within 5 km of *T. flynnii* provide critical habitat for 117 plant taxa known from only Kaua'i (Wood, unpublished data). These single-island endemics appear adapted to particularly narrow niches, and illustrate the phenomenon of prolific speciation and divergence through isolation, often observed in insular situations (Carlquist, 1974). These endemics are also probable host plants for an unknown number of native arthropods that have evolved to occupy their own microhabitats (Wood, unpublished data).

Acknowledgments. We thank Tim Flynn for bringing the new species to our attention, David Lorence of NTBG for assistance with selecting and distributing the available herbarium material and helpful comments on the manuscript, and an anonymous reviewer for valuable suggestions. We also gratefully acknowledge the efforts of the University of Hawai'i's micro-propagation lab at Lyon Arboretum on O'ahu, and the Hawai'i Department of Land and Natural Resources, Kaua'i Division of State Parks for permission to collect and conduct fieldwork. The fine illustration was prepared by John Myers, and the photographs were made by D. Liittschwager and S. Middleton. We thank Roy Gereau for translation of the Latin diagnosis.

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New Boraginaceae from Tropical America 2: *Tournefortia vasquezii*, a New Species from Peru

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ABSTRACT. *Tournefortia vasquezii* J. S. Miller is described from Cajamarca, Peru. It is a distinctive species with setaceous sepals, 4–6 mm long, and its unusual bullate leaves are unique in the genus. While its relationships within the genus are not clear, it shares its shrubby growth form, setaceous sepals, ovate corolla lobes, and elongate styles with *Tournefortia spicata* J. S. Miller and *T. restrepoae* J. S. Miller, other understory species of mid-elevation Andean forests.

The genus *Tournefortia* L. occurs throughout the tropics, but is nearly absent in Africa and only sparsely represented in Indian Ocean islands and tropical Asia. The majority of its more than 150 species occur in the Neotropics (Johnston, 1930, 1935a, 1935b; Miller, 1988). South America, particularly the northern Andes, is especially rich in species of *Tournefortia*. Macbride (1960) recognized 22 species of *Tournefortia* in the *Flora of Peru*, Brako (1993) increased that number to 26, and the species described below is another of many narrowly distributed endemics from mid-elevation Andean forests, some of which have been recently described (Miller, 1989, 1995, 1997).

The genus has largely been ignored in modern times and only addressed in floristic studies. The most modern treatments available for the South American species are from Johnston (1930, 1935a), neither of which covers the Andes, the center of diversity for the genus. Ellsworth P. Killip (unpublished) prepared a nearly complete manuscript treating the Andean species, several versions of which exist in the Smithsonian Institution, but this was never completed and published. The genus *Tournefortia* comprises three sections: *T.* sect. *Messerschmidia* (L.) DC., a group of three unusual species with corky exocarps, *T.* sect. *Cyphocyema* I. M. Johnston, a group of perhaps a dozen Neotropical species characterized by distinctly four-lobed fruits, and *T.* sect. *Tournefortia*, a rather homogeneous, pantropical section of more than 100 species.

Tournefortia vasquezii J. S. Miller, sp. nov. TYPE: Peru. Cajamarca: San Ignacio Province, San Jose de Lurdes, Santo Tomas, bosque primario, 4°55′S, 78°50′W, elev. 2200 m, 15 jun. 1995, *R. Vasquez, C. Diaz & A. Torres 20220* (holotype, MO 4926847). Figure 1.

Frutex sciophilus, ramulis pubescentibus. Folia alterna; lamina elliptica, 12–21.5 cm longa, 7–9.8 cm lata, apice acuminata, base cuneata ad acutam margine irregulariter et minute serrulata, bullata, areolis elevatis in trichomis terminantibus; petiolus 4–15 mm longus, supra canaliculatus, pubescens. Inflorescentia terminalis ex cyma dichotoma; pedicelli ca. 0.5 mm longis inter se 1–2 mm distantes. Flos sepalis setaceis 4–6 mm longis; corolla alba, tubuliformis, 6–8 mm longa, lobulis late ovatis, ca. 2 mm longis; antherae lanceoloideae, ca. 2 mm longae; stylus ca. 1.5 mm longus; stigma conoideum. Fructus ignotus.

Soft-stemmed understory subshrub 0.3 m tall, the twigs rough and densely pubescent. Leaves alternate; leaf blades elliptic, 12–21.5 × 7–9.8 cm, acuminate at the apex, cuneate to acute at the base, minutely and irregularly serrulate along the margin, the teeth uneven in shape, often ending in a trichome or with an appressed trichome arising from the center of the upper surface of each tooth, the adaxial surface glabrous and smooth along the veins, bullate between the veins, each areole with 1 to 5 raised bullae, each terminating in an appressed to spreading, siliceous hair 0.6–1.2 mm long, the abaxial surface sparsely, but evenly, puberulent, the hairs curved, less than 0.5 mm long, the surface invaginated beneath the raised bullae of the adaxial surface, the venation brochidodromous, the midrib impressed above, the secondary veins 7 to 9; petioles 4–15 mm long, canaliculate on the adaxial surface, rough and densely pubescent. Inflorescence a terminal, once-dichotomously branched cyme, the branches ca. 2 cm long, the peduncle ca. 2 cm long, pubescent. Flowers bisexual, borne 1–2 mm apart on densely pubescent, short pedicels ca. 0.5 mm long; sepals setaceous, ± equal in length, 4–6 mm long, with scattered, appressed to spreading curved hairs; corolla white, tubular, 6–8 mm long, sparsely appressed pubescent on the exterior surface, the lobes broadly ovate, ca. 2 mm long, ca. 2 mm wide, crenulate on

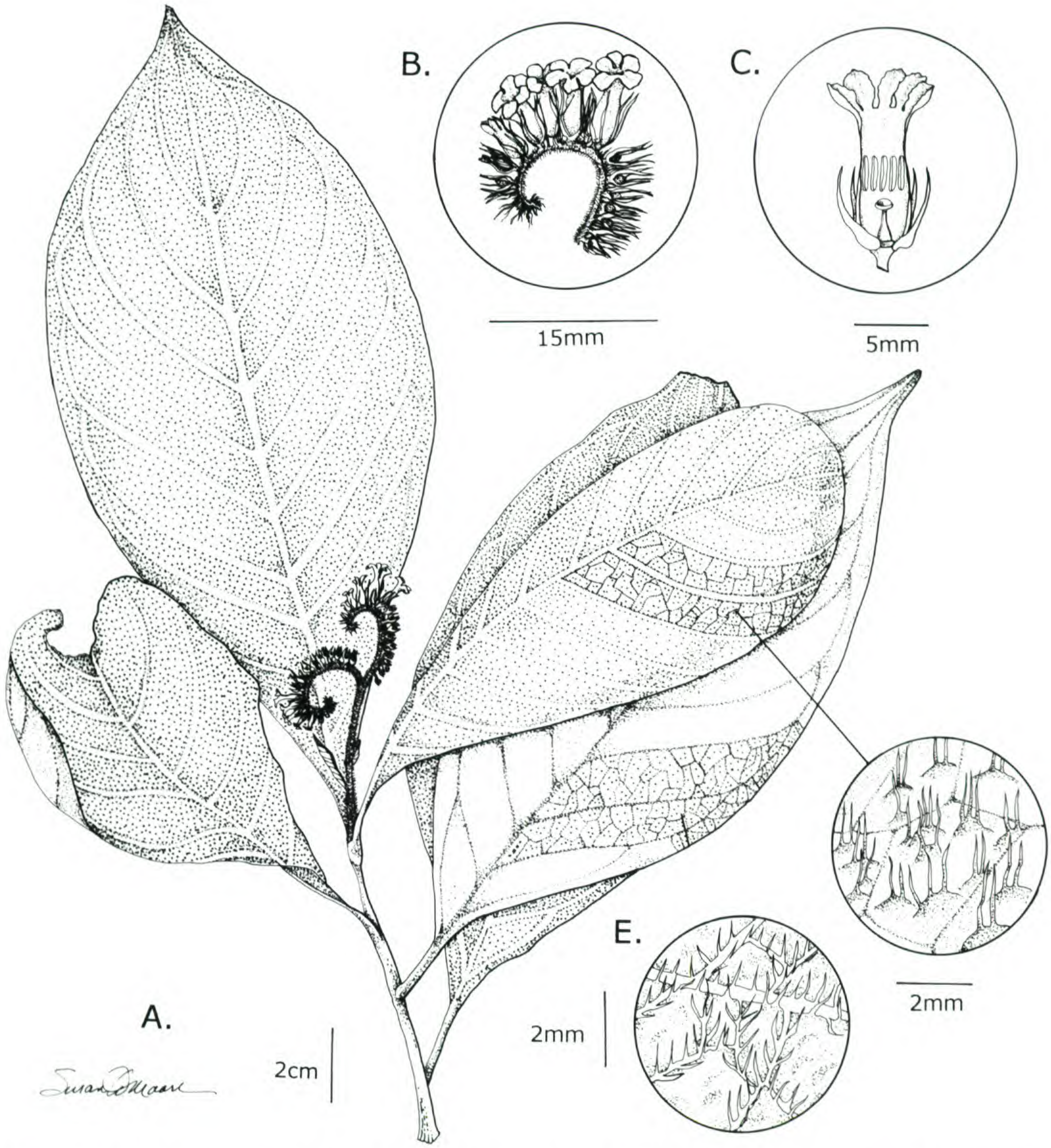

Figure 1. *Tournefortia vasquezii* J. S. Miller. —A. Flowering branch. —B. Inflorescence. —C. Flower showing ovary with short style and opened corolla tube with inserted anthers. —D. Adaxial leaf surface. —E. Abaxial leaf surface. (All from *Vasquez et al. 20220*, MO.)

the margin; anthers borne ca. 4 mm above the base of the corolla tube, sessile, attached basally, lanceoloid, ca. 2 mm long, the connective prolonged in a short sterile projection distally; ovary ovoid, ca. 1 mm long, the style ca. 1.5 mm long, the stigma depressed conical, the non-receptive apical portion only slightly elevated above the annular receptive tissue. Fruits unknown.

Tournefortia vasquezii is known only from the type, which was collected in primary wet montane forest in Cajamarca. The species is named in honor of Rodolfo Vasquez, whose collections and research have done so much to add to our knowledge of Peruvian plants.

Tournefortia sect. *Tournefortia* is a large, rather homogeneous section, and relationships of its constituent species are poorly understood. *Tournefortia vasquezii* is very distinct and is easily recognized by it bullate leaf surface, a character that is unusual in the genus. It is perhaps most closely related to *T. restrepoae*, a Colombian species with which it shares elongate, setaceous sepals and el-

evated areoles. However, the leaf surface of *T. vasquezii* is much more distinctively bullate, it has a terminal, rather than internodal inflorescence, and its flowers are borne on pedicels ca. 0.5 mm long, rather than the 1.5–4-mm pedicels of *T. restepoae*. Its long setaceous sepals are also an unusual feature in the genus, but most other species with this feature share few other characters with *T. vasquezii*. *Tournefortia spicata* J. S. Miller, another Colombian understory species with elongate, setaceous sepals, differs in its smoother leaf surface, dense inflorescence, and longer corollas.

Acknowledgments. I thank the Smithsonian Institution, particularly Joan Nowicke, for making E. P. Killip's unpublished manuscript available. I also thank the late W. G. D'Arcy, R. Keating, and W. D. Stevens for morphological advice and Barbara Alongi for preparing the illustration.

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New Boraginaceae from Tropical America 3: A New *Tournefortia* from Ecuador and Colombia

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ABSTRACT. *Tournefortia gigantifolia*, an unusual understory shrub, is described as new from wet forests in Ecuador and Colombia. It is distinct in its monocaulous or sparsely branched habit with large punctate leaves clustered near the stem apices. Its free anthers and unlobed fruits indicate clearly that it is a member of *Tournefortia* sect. *Tournefortia*, but its relationships with other species are not evident.

RESUMEN. *Tournefortia gigantifolia*, un arbusto excepcional de sotobosque, se describe como nueva especie. Habita en bosques húmedos en Ecuador y Colombia. Es distintivo en su forma de crecimiento monocaule o con pocas ramas, con hojas grandes que presentan abundantes puntos en el haz; las hojas estan agrupadas cerca de los ápices de los tallos. Aunque esta nueva especie claramente pertenece al género *Tournefortia*, sección *Tournefortia*, sur parentesco con las otras especies de la sección no está claro.

The pantropical genus *Tournefortia* L. comprises at least 150 species that are strongly centered in the Neotropics. Most modern authors have treated the genus in a broad sense (Nowicke, 1969; Gibson, 1970; Nowicke & Skvarla, 1974) and have included species in three sections, although the nomenclature has been confused. Johnston (1930) recognized section *Cyphocyema* I. M. Johnston, a group of perhaps 20 species confined to the New World tropics, and section *Tournefortia* (as sect. *Eutournefortia*), which comprises the vast majority of the genus with well over 130 species. One species of section *Tournefortia* occurs in eastern Africa (Verdcourt, 1988), four are found in Madagascar and the Mascarenes, and eight range from southern Asia through the Philippines to Australia (Johnston, 1935b). The more than 100 species that occur in tropical America are mostly South American, and the majority of these species are found in the Andean countries. The third section, sect. *Mallatonia* Grisebach, consists of three species widely distributed in the Caribbean, Indian, and Pacific oceans. Johnston's opinion on the placement of these species varied widely through his publications on the genus (Johnston, 1930, 1935a, b, 1949, 1951), and some authors have followed Britton (1915) in recognizing these species as generically distinct, but they have often been grouped together.

The genus has all but been ignored by modern monographers, and the last comprehensive treatment was that of De Candolle (1845). Since that time, the New World species have been treated only in floristic works and regional studies. The Central American species are comparatively well studied, having been treated for Veracruz (Nash & Moreno, 1981), Guatemala (Gibson, 1970), Nicaragua (Miller, in press), and Panama (Nowicke, 1969; Miller, 1988). Two studies of South American species of *Tournefortia* were published by Ivan Johnston that treated the species of Brazil, Paraguay, Uruguay, and Argentina (Johnston, 1930) and the Guianas and adjacent Brazil north of the Amazon (Johnston, 1935a).

Unfortunately, the Andean countries, certainly the center of diversity for the genus, have largely been ignored. E. P. Killip prepared, but never published (see Nowicke, 1974, for a more complete discussion of Killip's unpublished manuscripts), a treatment for the Andean countries, including Venezuela, Colombia, Ecuador, Peru, and Bolivia, and Killip's manuscript still exists in the archives of the National Herbarium at the Smithsonian Institution. While never submitted for publication, Killip's work did serve as the basis for two papers describing new species from the region (Killip, 1927, 1929). One more of the species recognized as new by Killip was later published by Nowicke (1974). Since Killip's effort there has been no comprehensive study of the Andean species, and new taxa from the northern Andean countries have been described individually (Johnston, 1956; Nowicke, 1974; Gentry, 1977; Gilli, 1983; Miller, 1989, 1995, 1997, 2000). While Killip's short papers published most of the new taxa that he recognized, several were never validly published; their use has nevertheless crept into herbaria from specimens that Killip annotated. One of these is for a plant from wet forests of northern Ecuador and adjacent Colombia that has never been described despite

having been collected repeatedly. The following description, and association with a modern type, validates the name that Killip intended to use.

Tournefortia gigantifolia Killip ex J. S. Miller, sp. nov. TYPE: Ecuador. Napo: Reserva Biológica Jatún Sacha, ca. 8 km ESE of Puerto Misahualli, primary forest along the Misahualli–Coca road, elev. 450 m, 1°4′S, 77°37′W, 3 July 1986, *James S. Miller, W. Wilbert & S. F. S. Medical Botany Class 2321* (holotype, MO 3896675; isotypes, QCA, US). Figure 1.

Frutex usque ad 1.5(–3) m altus, ramulis glabris vel sparse puberulentis ad grosse tomentosis. Folia alterna; lamina oblanceolata ad lanceolata, (22–)30–50(–60) cm longa, (7–)9–13(–16) cm lata, apice acuminata ad attenuata vel acuta, basi attenuata vel decurrenti, supra glabra et dense punctata, infra glabra vel minute strigillosa; petiolo 0.5–1(–4) cm longo, glabro ad grosse tomentoso. Inflorescentia internodalis, pedunculo (6–)8–20(–24) cm longo. Flores sessiles vel in pedunculis brevibus ad 1.5(–3) mm longis, seorsum 0.5–2 mm dispositis, bisexualis; sepala lanceolata, 3–5 mm longa; corolla alba ad viridis, tubularis, 6–13 mm longis.

Unbranched or sparsely branched shrub to 1.5(–3) m tall, the stems glabrous or sparsely puberulent to coarsely tomentose, the hairs brown, thick, flattened, contorted, and uneven. Leaves alternate, clustered near the stem apex; leaf blade oblanceolate to lanceolate, (22–)30–50(–60) cm long, (7–)9–13(–16) cm wide, the apex acuminate to attenuate or acute, the base attenuate or decurrent, the margin entire, sometimes irregularly undulate, usually minutely revolute, the adaxial surface glabrous, often densely and evenly punctate, the abaxial surface glabrous or minutely strigillose with the hairs mostly near and parallel to the secondary veins, the venation brochidodromous, the midrib evident above and usually even with the surface, prominent and raised below, glabrous to strigillose, sometimes with the coarse tomentum of the stems and petioles extending onto the lower part of the midrib, the secondary veins 7 to 13 (to 20), obscure near the margin on the upper surface, evident and raised below, connecting with the adjacent veins in a series of arched secondary loops; petioles stout, 0.5–1(–4) cm long or nearly absent and the leaves ± sessile, glabrous to coarsely tomentose, the hairs like those of the stems. Inflorescences borne among the leaves, internodal but often borne just above the leaf axils and appearing nearly axillary, cymose and variable in form, the 4 to 13 helicoid branches usually arising at or near the same point, or the peduncle branching once or twice before the ultimate branching, the peduncle (6–)8–20(–24) cm long, coarsely tomentose to puberulent, often somewhat fasciated at the point where the ultimate branches arise, the flowers 0.5–2 mm apart, nearly sessile or on short pedicels 1.5(–3) mm long. Flowers bisexual; sepals lanceolate, 3–5 mm long, 0.7–1.5 mm wide, glabrous or with a few minute hairs near the margins, the midrib very prominent; corolla white to green, tubular, 6–13 mm long, the 5 lobes short, parallel-sided and truncate as corollas open but spreading to widely ovate and rounded at mid-anthesis, 1–1.5 mm long, 0.8–2 mm wide, glabrous; stamens 5, the filaments 3.5–5 mm long, completely adnate to the corolla tube, the anthers ellipsoid, 0.6–1 mm long, borne just above the stigma; ovary not distinct from the style, ca. 1 mm long, ca. 1 mm wide, the style 2.5–6.5 mm long, the stigma conical with the sterile portion extending ca. 0.5 mm beyond the prominent annular receptive portion. Fruits white, drupaceous, broadly ovoid, 4–5.5 mm long, 5–6 mm wide, glabrous, the four pyrenes minutely rugulose on the exterior surface.

Tournefortia gigantifolia occurs as an understory shrub in wet forests from 450 to 1800 m in southwestern Colombia and northern and eastern Ecuador.

Tournefortia gigantifolia is a distinctive species, and its relationships within section *Tournefortia* are not apparent. It is easily recognized by its monocaulous growth habit with large, often nearly sessile, punctate leaves clustered near the stem apex, its long pedunculate inflorescences, and its long tubular greenish white corollas. It superficially resembles *Tournefortia longifolia* Ruiz & Pavón of Peru, but that species differs in having smaller leaves, less than 15 cm long, that are more widely spaced on the stems. It might also be confused with *T. foetidissima* L., which differs in having linear-lanceolate corolla lobes that are acute at the apex and a style that is shorter than the stigma. Both of these species also lack the punctations on the leaves that are characteristic of *T. gigantifolia*.

Additional specimens examined. COLOMBIA. **Chocó:** Carretera Istmina–Quibdó, entre El Dos y Las Animas, 5°15–18′N, 76°38–40′W, *Forero et al. 5471* (MO). **Nariño:** Reserva Natural La Planada, a 7 km de Chucunés, elev. 1800 m, 1°10′N, 77°58′W, *Benavides 8801* (MO); Reserva La Planada, Quebradas, El Mar–La Calladita, elev. 1500–1800 m, 1°10′N, 77°58′W, *Benavides 9611* (MO); La Planada, S of Ricaurte, 7 km from Tumaco–Pasto road, cloud forest, elev. 1800 m, 1°10′N, 77°58′W, *Gentry et al. 55123a* (MO); Junín–Barbacoas road, 2–10 km N of Junín, pluvial forest, elev. 900–1000 m, 1°30′N, 78°10′W, *Gentry et al. 55294* (MO); La Planada Reserve, 7 km from Chucunés, cloud forest, 1°05′N, 78°01′W, *Gentry et al. 60532* (MO); trail from La Planada to Pielapi, wet lower montane cloud forest, elev. 1600–1800 m, 1°04′N, 78°02′W, *Gentry et al. 63590* (MO); Reserva Natural La Planada, municipio de Ricaurte, elev. 1800 m, *Restrepo*

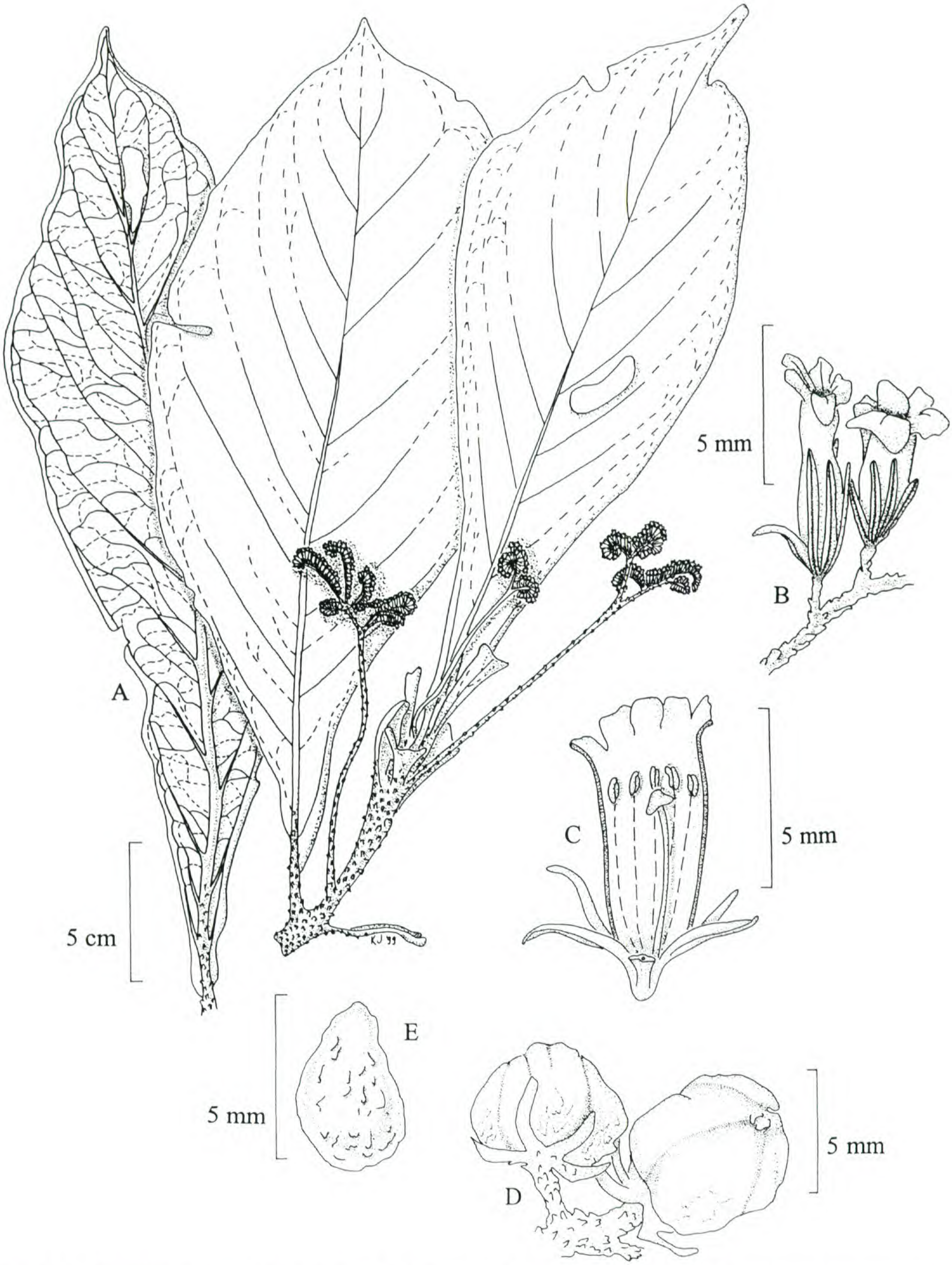

Figure 1. *Tournefortia gigantifolia* Killip ex J. S. Miller. —A. Flowering branch. —B. Portion of inflorescence with two open flowers. —C. Flower with front sepal removed and corolla longitudinally sectioned to show relation of gynoecium to anthers. —D. Portion of infructescence with two fruits. —E. Adaxial surface of pyrene with exocarp removed (all from *Cerón 6058*, MO).

516 (MO). **Putumayo:** San José, Río Putumayo, *Sprague 612* (US). ECUADOR. **Carchi:** Maldonado, Parroquia Tobar Donoso, Reserva Etnica Awá, Sabalera, bosque humedo tropical, elev. 900 m, 00°55′N, 78°32′W, *Aulestia et al. 792* (MO); SE trail, primary forest in Gualpi Chicó area of Awá Reserve, near encampment, 1330 m, 0°58′N, 78°16′W, *Hoover et al. 2796* (MO); Tulcán Cantón, Parroquia Chical, Sector Gualpi medio, Reserva Indigena Awá, Sendero a San Marcos al norte de la casa comunal, bosque muy humedo premontano, 01°02′N, 78°16′W, *Tipaz et al. 1117* (MO); Tulcán Cantón, Parroquia Tobar Donoso, sector Sabalera, Reserva Indígena Awá, Bosque primario Noreste Casa Comunal, bosque muy húmedo premontano, elev. 650–1000 m, 01°00′N, 78°24′W, *Tipaz et al. 1496* (MO); Tulcán Cantón, Parroquia Tobar Donoso, Reserva Indígena Awá, Centro El Baboso, bosque muy húmedo premontano, elev. 1800 m, 00°53′N, 78°25′W, *Tipaz et al. 1918* (MO); Lita, wet evergreen forest, elev. 600 m, *van der Werff 9541* (MO). **Cotopaxi:** Tenefuerte, Río Pilalo, Km 52–53, Quevedo, Latacunga, elev. 750–1300 m, *Dodson & Gentry 12818* (MO); Tenefuerte, Km 55 Quevedo–Latacunga, elev. 850–1000 m, *Dodson et al. 14421* (MO). **Esmeraldas:** new road under construction from Lita to San Lorenzo, 600–800 m, 00°58′N, 78°35′W, *Gentry et al. 69957* (MO); road between Lita, Alto Tambo and beyond, 2500 ft., *Kress et al. 88–2304* (US); Cantón Eloy Alfaro, Comuna de Calle Mansa (Río Grande, afluente del Cayapas), elev. 130–180 m, 00°44′N, 78°53′W, *Vánez et al. 1474* (MO). **Morona-Santiago:** Pozo petrolero "Garza" de TENNECO, 35 km al noreste de Montalvo, bosque húmedo tropical, elev. 260 m, 01°49′S, 76°42′W, *Zak & Espinoza 4695* (MO). **Napo:** Reserva Biológica Jatún Sacha, Río Napo, 8 km al E de Misahualli, bosque muy húmedo tropical, elev. 450 m, 01°04′S, 77°36′W, *Cerón 1055* (MO); Reserva Biológica Jatún Sacha, bosque muy húmedo tropical, 450 m, 01°04′S, 77°36′W, *Cerón & Cerón 4684* (MO); Cantón Tena, Estación Biológica Jatún Sacha, 8 km al este de Misahualli, bosque muy húmedo tropical, 400 m, 1°04′S, 77°36′W, *Cerón 6058* (MO); along road between Baeza and Lago Agria, 72.5 km W of Lago Agria, elev. 1166 m, *Croat 49526* (MO); Cantón Archidona, area al sureste del Volcán Sumaco, carretera Hollín–Loreto, Km 65, Huaticocha, bosque muy húmedo tropical, elev. 620 m, 00°45′S, 77°28′W, *Hurtado 2334* (MO); margen derecho del Río Napo, 8 km de Puerto Misahualli, bosque muy humedo tropical, elev. 450 m, 01°04′S, 77°37′W, *Palacios 2967* (MO); 8 km río abajo de Puerto Misahualli, por el Río Napo, elev. 450 m, 1°04′S, 77°36′W, *Zaruma et al. 261* (MO). **Pastaza:** Pastaza Cantón, Pozo Petrolero "Corrientes" de UNOCAL, bosque húmedo tropical, elev. 300 m, 01°43′S, 76°49′W, *Gudiño 665* (MO); Pastaza Cantón, Pozo Petrolero Villano 2, bosque húmedo tropical, elev. 350 m, 01°29′S, 77°27′W, *Palacios 10254* (US). **Pichincha:** Centinela, Cantón Santo Domingo, 12 km E of Patricia Pilar, elev. 600 m, *Dodson & Embree 7208* (MO); path following ridge line at El Centinela at crest of Montanas de lla road from Patricia Pilar to 24 de Mayo at Km 12 (Patricia Pilar is at Km 45 on road from Santo Domingo to Quevedo), elev. 600 m, *Dodson & Duke 7650* (MO), *Dodson et al. 8675* (MO); Centinela, 12 km al este de Patricia Pilar en el Km 47 Santo Domingo a Quevedo, elev. 650 m, *Dodson et al. 14773* (MO); elev. 600 m, *Dodson & Neill 15535* (MO); Reserva Florística-Ecológica "Río Guajalito," Km 59 de la carretera antigua Quito–Santo Domingo de los Colorados, 3.5 km al NE de la carretera, elev. 1800–2200 m, 0°13′53″S, 78°48′10″W, *Jaramillo & Zak 8013* (MO); Reserva Florística-Ecológica "Río Guajalito," Km 59 de la carretera antigua Quito–Santo Domingo, bosque muy húmedo montano bajo, elev. 1800–2200 m, 00°13′S, 78°48′W, *Zak & Jaramillo 3734* (MO).

Acknowledgments. I thank Kim Martin for the illustration, the Smithsonian Institution, particularly Joan Nowicke, for making Killip's unpublished manuscript available, and Philip Silverstone-Sopkin for review comments.

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Three New Species of *Jaltomata* (Solanaceae) from Ancash, Peru

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ABSTRACT. Three new *Jaltomata* species from the department of Ancash, Peru, are described and illustrated. The three species are distinguished from others in the genus by features of the flowers, hairs, and leaves. Fruits of *Jaltomata cajacayensis* S. Leiva & Mione are gathered for consumption. *Jaltomata lomana* Mione & S. Leiva is known only from a single fog-dependent plant community, a lomas formation. *Jaltomata yungayensis* Mione & S. Leiva is widely distributed at high elevations.

Species of *Jaltomata* have simple, often geminate leaves, 5-merous flowers with rotate to campanulate or tubular corollas, and a bicarpellate ovary housing numerous ovules. The inflorescence is umbellate; anthers dehisce longitudinally and the ovary is girdled by a disk at its base. The berry, orange or red on most South American species and dark purple to black on most Central American species, is not enclosed by the calyx and is often edible (Leiva, 1998; Mione, 1992). The genus includes about 50 herbaceous and shrubby species distributed from Arizona, U.S.A., to Bolivia, with one species each on the Galápagos Islands and Greater Antilles (Mione et al., 1993). These descriptions of three new species are a contribution to ongoing systematic studies of this genus (e.g., Mione, 1999; Mione & Leiva, 1997).

MATERIALS AND METHODS

The compound light microscope was used for measurement of stalked glands and stigma papillae; flowers placed in 70% ethanol in Peru were used. The sizes of structures as indicated by the scale bars in the figures may differ somewhat from the sizes given in the descriptions because alcohol-preserved flowers were used for drawing, while dried specimens were used for measurements. Seeds of *J. lomana* were not available for study.

Trichomes are not gland-tipped unless indicated as such. Finger hairs are uniseriate, unbranched, and multicellular. Branchlet hairs (Fig. 3B) have multiple termini (Seithe, 1979). A gland-tipped finger hair has a bulbous terminal cell (Fig. 1C) that stains densely with neutral red, as does the multicellular head of a stalked gland (illustrated in Mione & Serazo, 1999).

Jaltomata cajacayensis S. Leiva & Mione, sp. nov. TYPE: Peru. Ancash: Bolognesi, highway from Pativilca to Recuay and Huaraz, km 90, town of Cajacay, 2540 m, open sun, roadside with *Agave andina* and *Carica candicans*, 18 Jan. 1998, *T. Mione, S. Leiva G. & L. Yacher 624* (holotype, NY; isotype, CONN). Figure 1.

Planta fruticosa; axes juvenes, folia, faciesque abaxialis calycis obtecta pilis indivisis apice glandiferentibus; folia ovata vel deltata, ad 9 cm longitudine, 10 cm latitudine, petiolo ad 3.2 cm longitudine; inflorescentia floribus 14 ut maximum; calyx 13 mm diametro maturitate fructus; corolla brevissime, tubulosa, limbo reflexo 10.3–19.2 mm diametro, olivacea; filamenta villosa secus proximales $\frac{1}{3}$ partes longitudinis; bacca aurantiaca, ad 9 mm diametro.

Shrub to 1.1 m high. Young axes, peduncles, pedicels, and abaxial faces of calyx villous with erect, gland-tipped finger hairs to 3 mm long. Woody stems glabrous, terete, to at least 1.5 cm diam. Leaves alternate, often geminate, the blade ovate or deltoid, to 9 × 10 cm, pubescence of gland-tipped finger hairs on both faces, the margin repand, sinuate or dentate with up to 5 pairs of broad, rounded teeth; petiole to 3.2 cm long. Inflorescence axillary or less commonly arising from a

stem dichotomy, umbellate, 6- to 14-flowered. Peduncle to 15 mm long, pedicel to 20 mm long. Calyx green at anthesis, 3–4 mm from pedicel to tip of lobe, ciliate with both branchlet hairs to 0.25 mm long and gland-tipped finger hairs to 1 mm long; adaxially pubescent with finger hairs to 0.4 mm long; calyx at fruit maturity (from *Leiva 1739*) stellate and 13 mm diam. Corolla short-tubular with a reflexed limb, dull olive-green, the tube (obscured by pressing) 1.5–2 × 6.5–8 mm, within the tube two dark green maculae flanking the radial vein extending to the tip of each corolla lobe, narrow purple ring surrounding mouth of tube, the limb 10.3–19.2 mm diam., the 5 lobes alternating with lobules, adaxially glabrous within tube and the limb pilosulose, the hairs 0.21–0.5 mm long, abaxially with finger hairs, some gland-tipped, 0.15–1.2 mm long, ciliate with finger hairs to 0.6 mm long. Stalked multicellular glands 75–90 μm long, abundant on both faces of calyx and abaxial corolla, uncommon on adaxial corolla. Stamens 7 mm long; filaments villous on proximal ⅕ of the length, the finger hairs purple, to 1.5 mm long, decreasing in length distally; anthers cream-colored, 1–2.1 mm long. Style 3.5–10 mm long; stigma capitate, dark green and exserted to 5.5 mm beyond anthers on living plants, 0.5–0.9 mm wide, the papillae 45 μm long. Nectar disk broad, girdling base of the ovary (Fig. 1H). Gynoecium glabrous. Mature berries orange (not seen, from informant at type locality), nearly spherical, 5–9 mm diam. Seeds (*Leiva 1739*) numerous, subtriangular to reniform, alveolate, 1.4–1.7 × 1.1–1.3 mm, 0.5–0.55 mm thick.

Uses, habitat, local name, phenology. When the type collection was made, two women told us that the fruits are sweet and commonly eaten by everyone, and that the plants are not deliberately cultivated but are common in and along the edge of agricultural fields. One woman told us that a tea made from leaves and flowers is used to treat stomach ache and children's diarrhea, and to bring regularity to the menstrual cycle. The Quechua name is "musho." Flowering in January, and flowering and fruiting in November.

Jaltomata cajacayensis is similar to *J. propinqua* (Miers) Mione & M. Nee in that both bear gland-tipped hairs and have a short-tubular corolla with a much broader limb. *Jaltomata cajacayensis* has a green corolla and cream-colored anthers, the style is exserted a few millimeters beyond the stamens, and it is known only from the vicinity of one montane town (Cajacay) in the department of Ancash; *J. propinqua* has blue to purple corollas and anthers, the style is twice the length of the stamens, and it is widely distributed in the department of Lima, Peru (Mione et al., 1993).

Paratypes. PERU. **Ancash:** Bolognesi, Cajacay, 2600 m, 18 Nov. 1995, *Leiva 1739* (AAU, CCVS, CORD, F, HAO, HUT, MO, NY, USM), 18 Jan. 1998, *Leiva et al. 2132* (F, HAO).

Jaltomata lomana Mione & S. Leiva, sp. nov. TYPE: Peru. Ancash: Casma, Lomas de Mongon, 9°37′S, 78°43′W, 450 m, 17 Sep. 1938, *H. E. Stork, O. B. Horton & C. Vargas C. 9183* (holotype, K; isotypes, G, GH). Figure 2.

Planta fruticosa; axes juvenes, folia, calyx fere glaber; folia ovata ad 6 cm longitudine, 3.4 cm latitudine, petiolo ad 7 mm longitudine; inflorescentia floribus 7 ut maximum; calyx 8–11 mm diametro, fructu; corolla breviter tubulosa, limbo patente 11–14 mm diametro, alba; filamenta villosa secus proximale dimidium longitudinis; bacca ad 6 mm diametro.

Shrub to 8 dm tall. Young axes, peduncles, pedicels, leaves, and calyx nearly glabrous, the finger hairs to 0.15 mm long where present. Larger

→

Figure 1. *Jaltomata cajacayensis* S. Leiva & Mione. —A. Branch with inflorescences and leaves. —B. Flower, oblique view. —C. Calyx, lateral view. —D. Corolla, overhead view showing basal adnation of stamens. —E. Stamen, ventral view, with abundant finger trichomes, base flattened by adpression to ovary. —F, G. Anther and distal portion of filament, lateral and dorsal views, respectively. —H. Gynoecium including basal disk. —I. Berry with calyx, lateral view. —J. Seed. (From *S. Leiva et al. 2132*, drawn by S. Leiva.)

Figure 2. *Jaltomata lomana* Mione & S. Leiva. —A. Branch with inflorescences and leaves, with segment of stem 2 mm wide to left. —B. Flower, lateral view. —C. Calyx, lateral view. —D. Corolla, dissected, overhead view showing basal adnation of stamens, with marginal hair 0.12 mm long to left. —E. Stamen, ventral view, with abundant finger hairs, base flattened by adpression to ovary. —F, G. Anther and distal portion of filament, lateral and dorsal views, respectively. —H. Gynoecium including basal disk. (From *S. Leiva et al. 2140*, drawn by S. Leiva.)

Figure 3. *Jaltomata yungayensis* Mione & S. Leiva. —A. Branch with inflorescences and leaves. —B. Flower, lateral view, with branchlet hair 0.15 mm long at lower right. —C. Corolla, dissected, overhead view showing basal adnation of stamens. —D. Stamen, ventral view, with finger trichomes, base flattened by adpression to ovary. —E, F. Anther and distal portion of filament, lateral and dorsal views, respectively. —G. Gynoecium including basal disk. —H. Berry with calyx, lateral view. —I. Seed. —J. Embryo from seed. (From *S. Leiva et al. 2138*, drawn by S. Leiva.)

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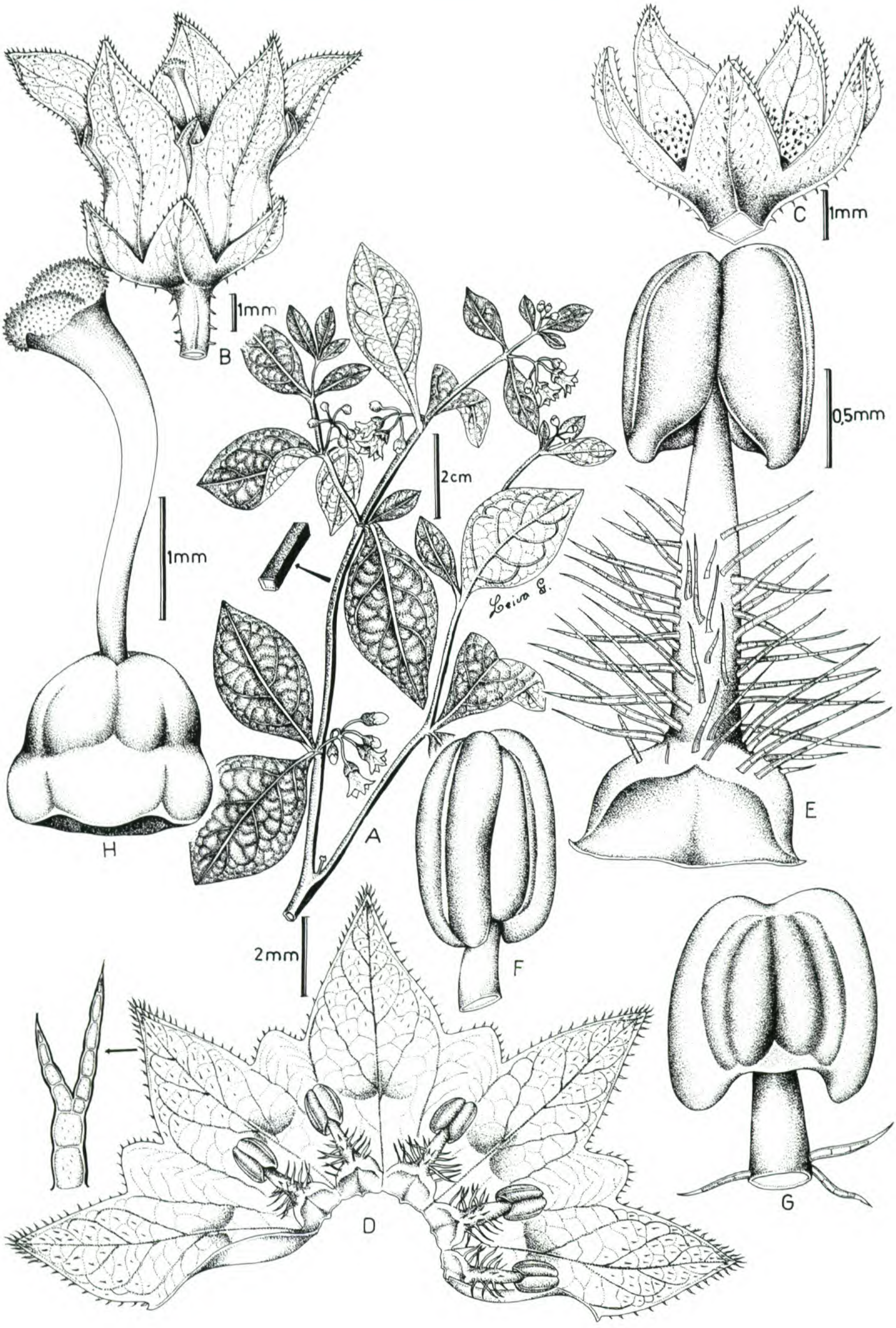
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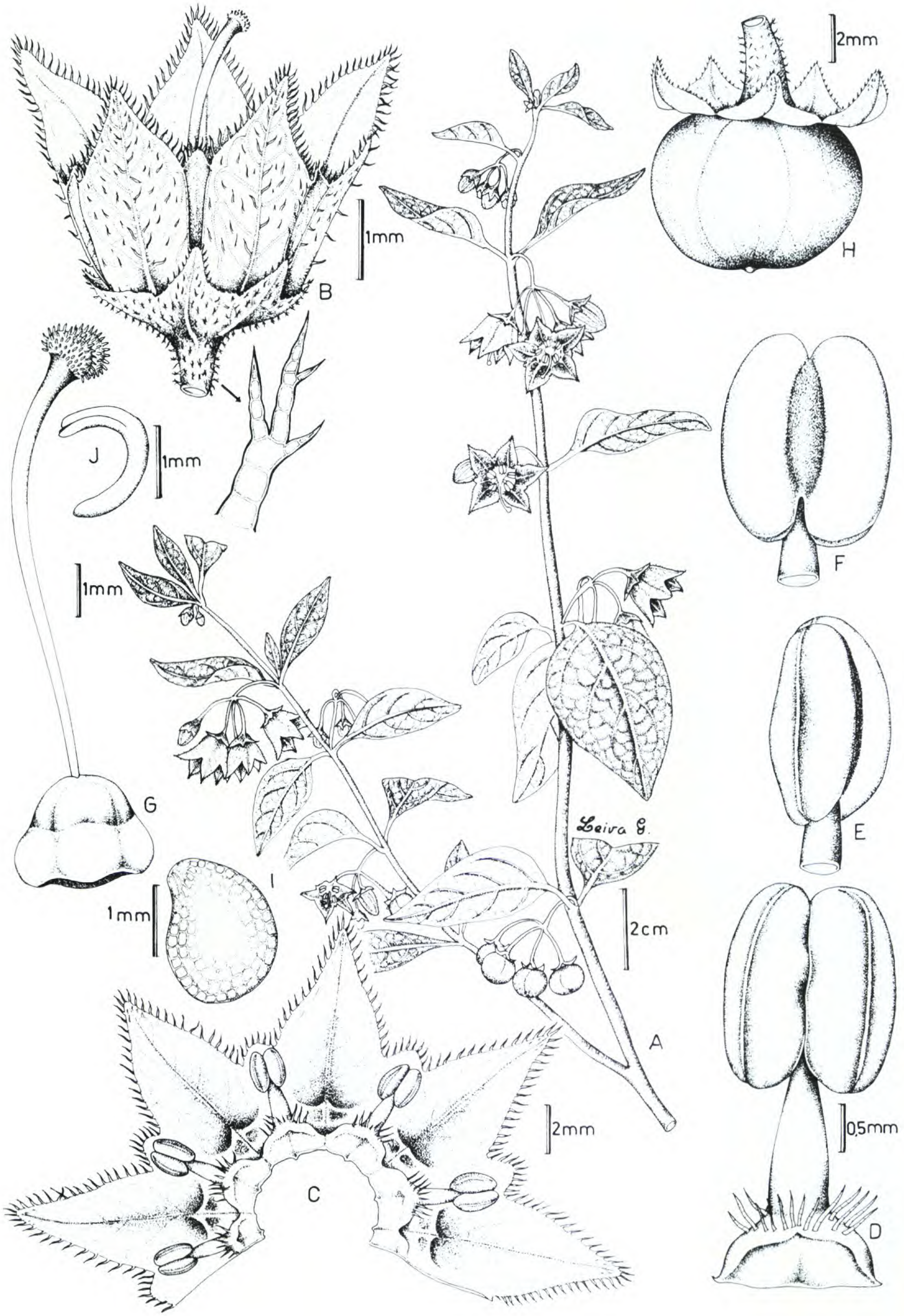
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branches glabrous, terete. Leaves alternate, often geminate, blade elliptical to ovate, to 6 × 3.4 cm, the margin entire, ciliolate with finger hairs to 0.15 mm long, the apex acute, the base symmetrical to somewhat oblique; petiole to 7 mm long. Inflorescence axillary or less commonly arising from a stem dichotomy, umbellate, 5- to 7-flowered. Peduncle 3–8 mm long; pedicel 5–14 mm long. Calyx at anthesis green, 3–4.8 mm from pedicel to tip of lobe, ciliolate with finger hairs to 0.1 mm; 8–11 mm diam. on mature (?) fruit. Corolla short-tubular with a spreading limb, white, the tube 1.6 × 4.0–4.3 mm at base (obscured by pressing), the limb 11–14 mm diam., 5-lobed, adaxially with finger hairs 0.12 mm long, erect and abundant on limb, absent in tube, abaxially with finger hairs 0.09 mm long, erect and concentrated on veins, margins ciliate with both finger and branchlet hairs 0.12 mm long. Stalked multicellular glands 55–75 μm long, abundant on both faces of the young leaves and calyx, and the abaxial face of the corolla (*Mione et al. 631*). Stamens 5.5–6.5 mm long; filaments villous on proximal ½, finger hairs to 0.75 mm long; anthers 0.6–1.5 mm long. Style 4.7–5.4 mm long, slender and straight; stigma capitate, shallowly bilobed, 0.36–0.51 mm wide, the papillae (*Mione et al. 631*) 20–25 μm long. Nectar disk at base of ovary. Berries (mature?) 4–6 mm diam.

Distribution and habitat. Known only from a single small mountain on the coast, the plant community of which is fog-dependent and therefore known as a lomas formation (Rundel et al., 1991). Flowering in January and September, and fruiting in September.

Jaltomata lomana is an erect, nearly glabrous shrub with petioles to 7 mm long and a white, short-tubular corolla having a spreading limb 11–14 mm in diameter. The type specimen of *J. lomana* (*Stork et al. 9183*) was considered to represent *Saracha dentata* Ruiz & Pavón (Macbride, 1962), but the latter species, now *J. dentata* (Ruiz & Pavón) Benítez, is procumbent, has rotate-campanulate purple corollas, and does not occur in lomas formations.

Paratypes. PERU. **Ancash:** Prov. Casma, km 350 of PanAmerican highway, walk ca. 4 km NW across desert to and up Lomas de Mongon, 630 m, growing in the protection of boulders, not on the open hillside, 20 Jan. 1998, *Leiva et al. 2140* (F, HAO), *Mione et al. 631* (MOL, NY).

Jaltomata yungayensis Mione & S. Leiva, sp. nov. TYPE: Peru. Ancash: Yungay, Cordillera Blanca, about 200–500 m into Huascarán National Park along road from city of Yungay to lake Chinan Cocha and lake Llanganuco, sunny, rocky roadside with shrubs, 3525 m, 19 Jan. 1998, *T. Mione, S. Leiva G. & L. Yacher 628* (holotype, NY; isotypes, CONN, MOL). Figure 3.

Planta fruticosa; axes juvenes, folia, faciesque abaxialis calycis puberula, pilis ramosis vel simplicibus; folia lanceolata vel elliptica, ad 6 cm longitudine, 2.1 cm latitudine, petiolo ad 2 cm longitudine; inflorescentia floribus 11 ut maximum; calyx 10 mm diametro maturitate fructus; corolla campanulata vel rotata, 11.5–15.5 mm diametro, purpurea, fauce viride; filamenta villosa secus proximalem ⅕ partem longitudinis; bacca aurantiaca, ad 8 mm diametro.

Shrub to 2.3 m high. Young axes, peduncles, pedicels, leaves, and abaxial faces of calyx puberulent, with both branchlet and finger hairs to 0.15 mm long. Woody stems brown, terete and hollow, glabrous with age. Leaves alternate, often geminate, the blade lanceolate to elliptical, to 4.9(–6) × 2.1(–4.8) cm, margins entire to repand, apex usually acute, the base of some leaves somewhat oblique; petiole to 2 cm long. Inflorescence axillary or less commonly arising from a stem dichotomy, umbellate, sometimes branched, 4- to 11-flowered. Peduncle to 10 mm long; pedicel to 9 mm long. Calyx green at anthesis, 2.5–3 mm from pedicel to tip of lobe, adaxially glabrous, margins ciliate with finger hairs to 0.25 mm long; at fruit maturity to 10 mm diam. Corolla campanulate to rotate, 11.5–15.5 mm diam., 5 lobes alternating with inconspicuous lobules (obscured by pressing); dark purple with a pale green throat having 5 pairs of dark-green maculae in a ring, each pair of maculae straddling the main vein that extends radially to the tip of the corolla lobe, abaxial face pubescent with finger hairs, and a few branchlet hairs, to 0.9 mm but commonly 0.3 mm long, adaxial face glabrous, margins off-white, ciliate with finger hairs to 0.75 mm long. Stalked multicellular glands 75–90 μm long abundant on abaxial and adaxial faces of calyx and abaxial face of corolla. Stamens 2.8–3.9 mm long; filaments villous on proximal ⅕, finger hairs unpigmented, 0.3 mm long; anthers cream-colored, 1.25–1.55 mm long. Style 6.4–7.6 mm long, straight. Stigma capitate, shallowly bilobed (obscured by pressing), 0.54–0.72 mm wide. Nectar disk at base of ovary, orange on living plants but red/orange nectar not observed. Gynoecium glabrous. Berries subspherical, to 8 mm across, orange at maturity. Seeds numerous, subreniform, alveolate, 1.6–1.8 × 1.3–1.5 mm, 0.45–0.54 mm thick. Infructescence up to 8-fruited.

Habitat, phenology, and local name. *Jaltomata yungayensis* has been collected from 3000 to 4150 m on steep south-facing scree slopes, in shrublands, and on roadsides among shrubs. Flowering and fruiting in January, October, and December, and flowering in April and May. A local name is

"lampuxso," and fruits are not eaten (*Leiva et al. 2139*).

Jaltomata yungayensis is similar to *J. diversa* (Macbride) Mione: both are shrubs of high altitude, and have branchlet hairs on young axes and leaves, and rotate to campanulate corollas. *Jaltomata yungayensis*, from Ancash, has pedunculate inflorescences, and the corolla is purple with a green throat. In contrast, *J. diversa* from the departments of Apurímac, Arequipa, Ayacucho, and Cuzco, Peru, lacks peduncles (umbels are sessile) and has a white corolla (Mione, 1999).

Paratypes. PERU. **Ancash:** Prov. Yungay, Huascarán National Park, regione Huaraz, 13 Oct. 1976, *Bernardi et al. 16680* (G, NY); Huascarán National Park, Llanganuco Sector, near park entrance, alt. 3330–3525 m, 30 Dec. 1984, *Smith & Goodwin 8875* (NY), 19 Jan. 1998, *Leiva et al. 2138* (CONN, HAO); along road from Yungay to lake Llanganuco, pueblo de Huashau, 3000 m, 19 Jan. 1998, *Leiva et al. 2139* (HAO), *Mione et al. 629, 630* (CONN); Prov. Huaylas, Huascarán National Park, Quebrada Santa Cruz between Lago Santa Cruz Chico and Cashapampa exit, 3870–3350 m, 17 Jan. 1985, *Smith et al. 9333* (MO); Huascarán National Park, Auquispuquio area of ruins, 3800–3900 m, 7 Apr. 1986, *Smith et al 11992* (MO, NY); Pucapampa (Lampanín-Huaylas), 4150 m, ladera, 3 May 1987, *Mostacero & Leiva 1897* (HUT, NY); Prov. Corongo, Cerro Clarinirka (arriba de Corongo), 3500–3600 m, 7 Aug. 1993, *Leiva & Lezama 865* (HAO), 28 June 1998, *Leiva et al. 2200* (HAO).

Acknowledgments. We thank Michael Nee for review, Gabriel Bernardello, Michael Dillon, and David Spooner for helpful correspondence, Neil R. Smith for translation to Latin, and the staff of the cited herbaria. A National Geographic Society grant (6008-97) to T. M. funded fieldwork and supplies.

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Validating an Endemic Melastomataceae from Goiás, Central Brazil: *Lavoisiera fragilis* Cogniaux ex Munhoz & Proença

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ABSTRACT. This paper validates a nomem nudum for an endemic *Lavoisiera* from Cristalina, Goiás, in central Brazil. It was first collected by Glaziou in 1895 and then sent to Cogniaux, who named it but never formally described it. The Cogniaux name is maintained since it is cited in Glaziou's published list of collections and on herbarium specimens. *Lavoisiera fragilis* is a small white-flowered tree that is protected by the Linda Serra dos Topázios Private Reserve.

RESUMO. Este trabalho torna válido um nomen nudum para uma *Lavoisiera* endêmica de Cristalina, Goiás no Brasil Central. A espécie foi coleta pela primeira vez por Glaziou em 1895 e enviada para Cogniaux, que a nomeou mas nunca a descreveu formalmente. O nome dado por Cogniaux é mantido por ter sido citado na lista publicada de coletas de Glaziou e por aparecer nas suas etiquetas de material herborizado. *Lavoisiera fragilis* é uma pequena árvore de flores alvas, protegida pela Reserva Particular de Patrimônio Natural (RPPN) Linda Serra dos Topázios.

The area around the city of Cristalina, Goiás, in central Brazil was first botanized by Joseph Emmanuel Pohl in 1818; at that time, it was already known as Serra dos Cristais (Urban, 1906). Like other isolated highland areas in the Cerrados domain, it appears to be an important center of endemism. Endemic taxa known to occur in the Serra dos Cristais belong to the Bromeliaceae, Burmanniaceae, Compositae, Leguminosae, Malpighiaceae, and Myrtaceae. The region is mined for rock crystal and topaz and is a minor tourist center. In 1994, a government-recognized private reserve of ca. 500 hectares, the Reserva Particular de Patrimônio Natural Linda Serra dos Topázios, was established there. The vegetation of the reserve is composed of wet grassy fields, wet fields with buriti palms (*Mauritia vinifera* Martius), aquatic plants, sparse cerrado, typical cerrado, tall mesophytic savanna woodland on a slope, campo rupestre, and riverine vegetation that is not dense enough to form a gallery forest.

After collecting the present species several times in flower and in fruit, we failed to identify it by comparison with identified specimens of *Lavoisiera* in the UB herbarium at the University of Brasília, many of which were determined by John Wurdack. Two specimens from Cristalina that matched our material were found, however. This resulted in surveying taxonomic literature on *Lavoisiera* through *Index Kewensis for Windows v. 2.0* (Royal Botanic Gardens Kew, 1997), and studying published species descriptions for *Lavoisiera* (De Candolle, 1828; Triana, 1871; Cogniaux, 1883; Taubert & Ule, 1896; Hoehne, 1922; Mello-Barreto, 1935, 1936, 1952; Markgraf, 1940; Wurdack, 1974, 1981, 1988, 1995). Since we failed to match our specimens with any published description, we then requested Elizabeth Woodgyer, a Melastomataceae specialist from the Royal Botanic Gardens at Kew, to compare our illustration to the Glaziou specimens at K collected in Goiás. She reported a positive match with *Glaziou 21312*, collected in Cristalina in 1895, and with a modern specimen also collected in Cristalina (*Pirani et al. 1552*), and sent cybachrome photographs of both specimens to us at UB. We later discovered a duplicate of the *Glaziou 21312* specimen at the Museu Nacional Herbarium in Rio de Janeiro (R). We are confident that our specimens are conspecific with the Glaziou and Pirani collections, and hereby formally describe the species.

Lavoisiera fragilis Cogniaux ex Munhoz & Proença, sp. nov. TYPE: Brazil. Goiás [Goyaz]: Almocafre, Serra dos Cristais [Crystaes], 16°45′S, 47°37′W, 17 Sep. 1895, *Glaziou 21312* (holotype, R; isotype, K not seen, UB photograph of isotype at K). Figure 1.

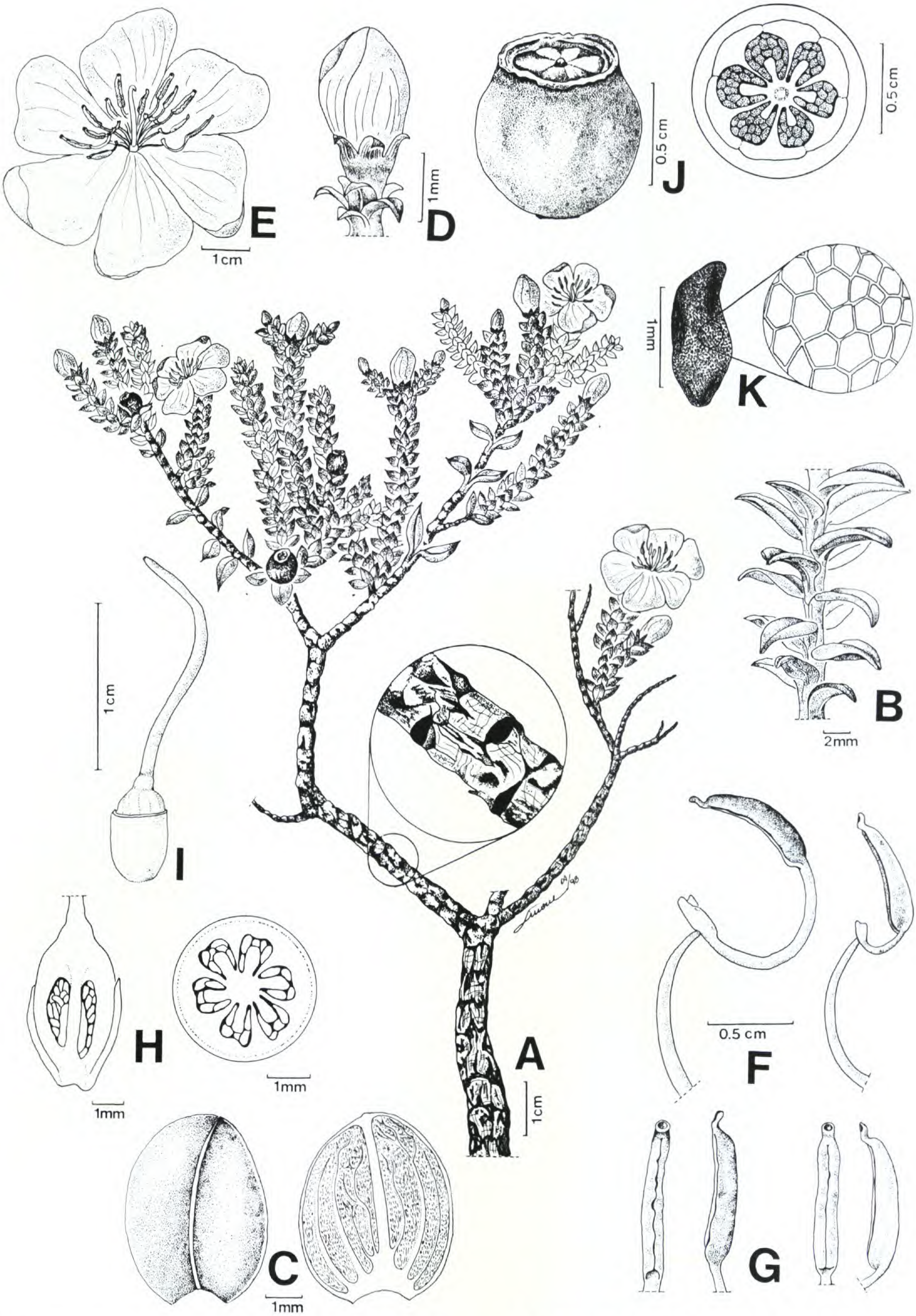

Figure 1. *Lavoisiera fragilis* Cogniaux ex Munhoz & Proença. —A. Habit with branchlet detail. —B. Leaf disposition on young branchlet. —C. Leaves, above (left) and below (right). —D. Flower bud. —E. Open flower. —F. Stamens, larger (left) and smaller (right). —G. Larger stamen anthers (left) in ventral and lateral view, smaller stamen anthers (right) in ventral and lateral view. —H. Ovary, longitudinal section (left) and transverse section (right). —I. Pistil. —J. Mature fruit, whole (left) and tranverse section (right). —K. Seed with testa detail. (A–K from *Oliveira et al. 285*, paratype.)

[*Lavoisiera fragilis* Cogniaux, nomen nudum, Glaziou Liste Collect. Bot., Mem. Soc. Bot. France 3: 256. 1907 (1903).]

Arbuscula 1.5–2.5 m alta; ramuli glabri. Folia sessilia imbricata; lamina 9–20 × 5–10 mm, cordata vel ovata-elliptica apice acuta base angustato semiamplexicaulibus, coriacea, supra glabra, subtus sparse sessilibus glanduliferis pilis, 3-nervata nervulis supra invisis. Flores (5)6-meri ad ramorum apices solitarii. Hypanthium (ad torum) 6–9 mm longum, campanulatum; calycis lobis 5–7 mm longi, triangulares, in fructu non persistentes. Stamina dimorpha, glabra. Stamina maiora antheris vinaceis, 6–7 mm longis, connectivum 8–10 mm prolongatum, appendice ventrali 1.5–2.3 mm. Stamina minora antheris flavis, 4–6 mm longis, connectivum 2.5–3 mm prolongatum, appendice ventrali 1 mm. Ovarium 6-loculare, glabrum, ⅔ inferum. Capsula globosa, 7–10 mm. Semina 1.5–2 mm, angulata, foveolata.

Small tree 1.5–2.5 m tall. Branchlets dichotomous, glabrous with conspicuous scars from the abscission of the leaves. Leaves sessile, imbricate; blades rigidly coriaceous, 9–20 × 5–10 mm, cordate to ovate-elliptic, apex narrowly acute; base narrowly amplexicaulous; adaxially glabrous 1-nervate; abaxially with sparse minute sessile glandular hairs, inconspicuously 3-nervate; margin revolute. Inflorescence terminal, reduced to a solitary, sessile, (5)6-merous flower. Hypanthium campanulate, 6–9 mm long to the torus, moderately covered with spreading glandular sessile hairs. Calyx lobes caducous in fruit, 5–7 mm long and 3–4 mm wide at the base, narrowly triangular, outer surface with spreading glandular sessile hairs, inner surface glabrous. Corolla glabrous, white or sometimes tinged with pink in bud or with pink nectar guides; petals basally yellowish, elliptic-obovate, obtuse to rounded at the apices, 15–27 × 9–17 mm, margins entire. Stamens 10 or 12 in number, dimorphic; longer filaments 6–8 mm long, yellow, with anthers 6–7 mm long, wine-colored, the connective prolonged 8–10 mm with a bifid ventral appendage 1.5–2.3 mm long; shorter filaments 5–7 mm long, yellow, with anthers 4–6 mm long, yellow, the connective prolonged 2.5–3 mm with an obtuse ventral appendage 1 mm long. Ovary ⅔ inferior, elliptic to ovoid, 6–7 × 2.5–3.5 mm, 6-locular, glabrous. Style glabrous, 1.2–1.7 cm long, incurved apically; stigma truncate. Capsule dry, semi-woody, globose, 7–10 mm long, 7–10 mm diam. Seeds numerous, angular-obovoid, 1.5–2 mm long; testa foveolate.

Distribution. This species appears to be a narrow endemic restricted to the Serra dos Cristais, Goiás, at 1050–1200 m s.m. *Lavoisiera fragilis* grows in sparse cerrado and campo rupestre on shallow, sandy, crystal-bearing soils, frequently forming large populations with *Mimosa decorticans* Barneby, another endemic species. These two taxa are practically the only trees amidst the grasses, sedges, and other herbaceous vegetation. It is quite common in this specific habitat, and we are pleased to report that it appears to be adequately protected by the new reserve.

Discussion

Lavoisiera fragilis is a distinctive species characterized by being a small, dichotomous tree, by its coriaceous, weakly 3-nervate leaves, large white flowers, nearly glabrous, campanulate hypanthium, and globose fruits with caducous calyx lobes. It is best assigned to section *Gentianoides* sensu Cogniaux (1883) and would be identified in the *Flora Brasiliensis* key to *Lavoisiera* (Cogniaux, 1883) as *L. pohliana* O. Berg ex Triana. Triana described *L. pohliana* based on a fruiting collection, so the flowers are unknown. Both species possess rigid, imbricate, semi-amplexicaulous leaves that are glabrous on the upper surface and sparsely glandulose on the lower surface. *Lavoisiera pohliana* is readily distinguished from *L. fragilis* by being a small shrub, by its calyx lobes, which are persistent in the fruit, and by its distribution, which is in the Chapada dos Columbis in the Jequitinhonha River region of eastern Minas Gerais.

Superficially, *Lavoisiera fragilis* is most similar to *L. cordata* Cogniaux, a species that is apparently endemic to the Serra do Cipó in Minas Gerais and that also belongs to section *Gentianoides*. The Serra do Cipó, like the Serra dos Cristais, is a high-altitude enclave of campo rupestre on the margin of the cerrado biome and consequently a strong center of endemism (Giulietti et al., 1987). Both species are arborescent and have large, hexamerous white flowers and very similar stamens. They differ mainly in the color and disposition of the leaves, which are glaucous and lax in *L. cordata* and shiny and imbricate in *L. fragilis*, by the shape of the hypanthium, which is infundibular in *L. cordata* and campanulate in *L. fragilis*, and by the calyx lobes, which are persistent in the fruit in *L. cordata* and caducous in *L. fragilis*.

The name *Lavoisiera fragilis* was presumably given to this species by Alfred Cogniaux; both the Glaziou list (Glaziou, 1907) and the Glaziou specimen at Kew identify this plant as "*Lavoisiera fragilis* Cogn.," and thus Glaziou must have sent the material to Cogniaux for identification. The wood is extremely weak, with even fairly large branches breaking quite easily, and this may be the origin of the epithet *fragilis*. The collection locality given by Glaziou (1907) is "Almocafre, Serra dos Crystaes,

Goyaz." Glaziou cited this collection as being in Paris, Kew, and Berlin, but we have accessed only two collections, one in Kew and one in Rio de Janeiro.

Since this name is cited in *Index Kewensis* and published in the Glaziou collections list (Glaziou, 1907), we feel it has entered the literature and have chosen to maintain it.

Lavoisiera fragilis is an extremely handsome tree, resembling an oversized bonsai due to its finely fissured gray bark, twisted branches, and small shiny leaves. The flowers are apparently produced all year-round.

Paratypes. BRAZIL. **Goiás:** Cristalina, 5 km S of Cristalina, Serra dos Cristais, 1 Nov. 1965 (fl, fr), *Irwin et al. 9738* (UB); ca. 2 km N of Cristalina, Serra dos Cristais, 2 Mar. 1966 (fl), *Irwin et al. 13296* (UB); Cristalina, ca. 5 km da cidade, estrada para Paracatu, 16°46′S, 47°37′W, 1050 m, 4 Feb. 1987 (fl), *Pirani et al. 1552* (K not seen, SPF, UB photo of K material); Cristalina, Reserva Particular de Patrimônio Natural Linda Serra dos Topázios, 16°45′S, 47°40′W, 15 Jan. 1995 (fl), *Proença & Sautchuk 1259* (UB), 29 Nov. 1995 (fl, fr), *Proença & Morreto 1327* (UB), 22 Mar. 1998 (fl, fr), *Oliveira et al.* 285 (K, MO, UB, UFG).

Acknowledgments. We thank Elizabeth Woodgyer for her kindness in comparing the illustration, and sending reprints and cybachromes of the type at K. We also thank the curators and technicians of R and RB for searching their collections for duplicates of the Glaziou type specimen, and José Fernando Baumgratz at RB for his personal intervention. We thank Simone C. Sousa e Silva for the illustration, Eduardo G. Gonçalves for reviewing the Latin diagnosis, and Rafael S. Oliveira for collecting and photographing the specimen from which the illustration was prepared. We owe a special debt to Jaime Sautchuk and Adinair França dos Santos, owners of the Linda Serra dos Topázios Reserve, for their unfailing enthusiasm and support during fieldwork in the Reserve. We also thank the two anonymous referees for their helpful and encouraging comments on the paper.

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Una Nueva Especie de *Croton* (Euphorbiaceae) de la Guayana Colombiana

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RESUMEN. Se describe e ilustra una nueva especie de *Croton* de la Guayana colombiana, *Croton araracuarae*. Debido a la pubescencia estrellada, estípulas enteras, y sobre todo por el espacio conspícuo entre las flores masculinas y femeninas de la misma inflorescencia, esta especie pertenece a la sección *Podostachys*, a pesar de poseer estilos bífidos y tener las hojas con venación pinnada. Se distingue de los demás miembros de la sección en sus hojas enteras y angostamente lanceoladas, y en tener las glándulas sésiles en el ápice del pecíolo.

ABSTRACT. A new species of *Croton* from the Colombian Guayana is described and illustrated as *Croton araracuarae*. By virtue of its stellate pubescence, entire stipules, and especially by the evident space between the staminate and pistillate flowers, it belongs to section *Podostachys*, even though it has bifid styles and pinnate leaf venation. It is differentiated from the other members of the section by its entire, narrowly lanceolate leaves and by the sessile glands at the apex of the petioles.

En una publicación reciente sobre las Euphorbiaceae de la región de Araracuara, Colombia (Murillo & Franco, 1995: 68–69 y fig. 13), se presentó una especie de *Croton* que no se pudo incluir en otra ya descrita. Después de conseguir colecciones adicionales de este taxón y confrontarlo con otras muestras de la región de la Guayana y con descripciones originales de otras especies del género, se pudo determinar que se trata de una especie aún no descrita, la cual se describe y discute en este trabajo.

Croton araracuarae J. Murillo, P. E. Berry & M. V. Arbeláez, sp. nov. TIPO: Colombia. Amazonas: Puerto Santander, afloramiento rocoso de Ciudad Perdida, 15 ago. 1998, *J. Murillo, A. Alfonso & J. Mandiego 1973* (holótipo, COL, isótipos, COAH, MO). Figura 1.

Haec species ad sectionem *Podostachyn* pertinet, sed ab aliis speciebus sectionis foliis lanceolatis marginibus integris, stylis bifidis, glandulis sessilibus ad apicem petioli distinguitur.

Arbusto monoico de 0.7–1.2 m, densamente cubierto con pelos estrellados de 0.2–0.5 mm de diámetro; exudado amarillento; estípulas diminutas, cubiertas por el indumento. Hojas simples, alternas, cartáceas; pecíolos de 4–10 mm de largo, acanalados, en el ápice con dos glándulas crateriformes de 0.5–0.8 mm de diámetro, sésiles; lámina angostamente ovado-lanceolada de 4–9 × 0.6–2.5 cm, ápice agudo a atenuado, base aguda, margen entero pero con glándulas marginales cubiertas por el indumento, pelos estrellados por la haz de 8 a 12 brazos y por el envés de 20 a 25 brazos, venación pinnada broquidódroma con venas secundarias poco aparentes, en 8 a 11(a 14) pares; venación terciaria inconspicua. Inflorescencia en racimo terminal de (1.2–)1.8–4 cm de largo, bisexual, las flores verde amarillentas, las masculinas concentradas en el ápice, las femeninas basales, 1 a 3, separadas de las masculinas por una porción del raquis sin flores de 0.7–2 cm de largo. Flor masculina con pedicelo de 0.5–0.6 mm de largo; bráctea angostamente triangular de 1.2 × 0.2 mm, ápice agudo, glabra en la cara interna; sépalos 5, ovados, de 1–1.8 × 0.8–1 mm, ápice agudo; pétalos 5, oblongos, de 1–1.8 × 0.2–0.3 mm, libres, con pelos simples abundantes en el margen; recep-

Figura 1. *Croton araracuarae* J. Murillo, P. E. Berry & M. V. Arbeláez. —A. Hábito. —B. Detalle del envés. —C. Flores masculinas en el ápice de la inflorescencia. —D. Flor masculina. —E. Flor femenina. —F. Fruto. —G. Semilla. Basada en *J. Murillo et al. 1973.*

táculo cónico, viloso; estambres 8 a 10(11), uno central, anteras basifijas, 0.3–0.5 mm de largo, filamentos de 1–1.8 mm de largo, glabros. Flor femenina con pedicelo de 1–2 mm de largo; apétala; sépalos 5, valvados, algo desiguales, angostamente elípticos de 2–3 × 0.8–1.0 mm, ápice agudo; ovario tricarpelar; estilos 3, ca. 1.5 mm de largo, bífidos. Cápsula trilobulada de 3–4(–5) × 3–4 mm, verde, pedicelo de 1–2.5 mm de largo. Semilla elipsoide de 2.5–3 × 2 × 1.2–1.5 mm, lisa, con carúncula pequeña.

Distribución y ecología. *Croton araracuarae* se encuentra en el extremo occidental del Escudo de Guayana en Colombia; en el país sólo se conoce para la región de Araracuara, en el límite de los departamentos de Amazonas y Caquetá. Es una planta heliófila que crece directamente sobre roca desnuda parcialmente erosionada o entre las grietas del afloramiento, en sabanas arbustivas de la formación Araracuara; localmente es común. Florece y fructifica la mayor parte del año.

La planta se conoce por los indígenas Uitoto con el nombre de "Jununguo yeroai," traduce al español "planta dulce de abejorro." Desde la aparición de los primeros dientes, los Uitoto mastican las hojas, mezcladas con hojas de otras plantas, para mantener los dientes sanos.

De acuerdo con la nueva circunscripción de las secciones en *Croton* (Webster, 1993), *C. araracuarae* pertenecería a la sección *Podostachys* (Klotzsch) Baillon, un grupo de unas diez especies americanas, distribuidas principalmente en la región de la Guayana. Esta sección se caracteriza por tener un indumento con pelos estrellados, láminas con pecíolos glandulares e inflorescencias terminales con un espacio evidente entre las flores masculinas y las femeninas. *Croton araracuarae* difiere de las otras especies de la sección en que tiene estilos bífidos y hojas con venación pinnada y márgenes enteros. A pesar de que Webster (1993) asevera que las especies de esta alianza con estilos bífidos se deben colocar en la sección *Octolobium* Chodat & Hassler, él mismo describe a la sección *Podostachys* con estilos "usualmente multifidos" y con hojas "± palmada-nervadas." Nuestra especie no cabría dentro de la sección *Octolobium*, ya que ésta tiene de 6 a 8 sépalos en las flores femeninas y entre 10 y 15 estambres en las flores masculinas, y *C. araracuarae* tiene 5 sépalos en las flores femeninas y de 8 a 11 estambres en las flores masculinas. Especies de la sección *Podostachys* de la Región Guayana que más se parecen a *C. araracuarae* son *C. spiraeifolius* y *C. subserratus*. *Croton spiraeifolius* se diferencia porque tiene hojas más elípticas y redondeadas en el ápice, mientras que en *C. subserratus* las hojas son fuertemente dentadas, y ambas tienen glándulas estipitadas en el ápice del pecíolo en vez de sésiles como en *C. araracuarae*.

Parátipos. COLOMBIA. **Amazonas:** Puerto Santander, afloramiento rocoso en Ciudad Perdida, 2 feb. 1993, *J. Murillo & A. Matapí 255* (COAH, COL). **Caquetá:** Araracuara, pista de aterrizaje, 200 m, 72°25′W, 00°35′S, 10–25 mayo 1998, *M. V. Arbeláez & J. Manaidego 1105* (HUA, MO); Río Caquetá, Paujil, 10 km noroeste de Araracuara, 26 oct. 1992, *M. V. Arbeláez et al. 265* (COAH, HUA), *M. V. Arbeláez et al. 492* (COAH, COL, HUA); noroeste de Araracuara, Río Caquetá, trocha a Monochoa, 72°20′W, 02°25′S, 17 nov. 1993, *D. Cárdenas, G. Gangi & J. Manaidego 4096* (COAH, MO); Puerto Arturo, afloramiento rocoso en el Paujil, 28 nov. 1992, *J. Murillo et al. 201* (COAH, COL).

Agradecimientos. A la Fundación Tropenbos por la financiación de las salidas de campo. Alejandro Jaramillo, coordinador de la Fundación en Araracuara, y el Instituto de Investigaciones Científicas SINCHI nos prestaron ayuda logística en la zona. Germán López elaboró la ilustración y Pedro Ortíz corrigió la diagnosis en latín.

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The Identity of *Grindelia angustifolia* DC. ex Dunal (Asteraceae: Astereae)

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Abstract. A colored painting from the Sessé and Mociño expedition serves as the holotype for the validly published name *Grindelia angustifolia* DC. ex Dunal, 1819 (= *Grindelia dunalii* Sprengel, nom. nov., 1825; non *Grindelia angustifolia* Kunth, in HBK, 1818). The illustration represents the species heretofore identified as *Keerlia linearifolia* DC., 1836 (= *Gutierrezia alamanii* A. Gray, nom. nov., 1852; non *Gutierrezia linearifolia* Lagasca & Segura, 1816), which occurs in the south-central Mexican states of México and Morelos. *Gutierrezia dunalii* (Sprengel) Nesom, comb. nov., is proposed as the earliest valid name for this species. *Gutierrezia megalocephala* (Fernald) Nesom is proposed for a closely related entity (*Gutierrezia alamanii* var. *megalocephala* (Fernald) Lane = *Xanthocephalum megalocephalum* Fernald).

The Sessé and Mociño expedition to New Spain (1787–1803) recorded many interesting observations, especially regarding the flora of Mexico. For a description of the expedition and its aims, travels, collections, paintings, and in particular its botanical accomplishments, see articles by McVaugh (1977, 1980, 1987, 1990, 1998) and a recent summary and update by Bartholomew and McVaugh (1997). Plant collections from the expedition are housed at a number of European herbaria as documentation for various early reports and names, but the paintings made in situ by expedition artists also provided the basic information for descriptions of new taxa. A. P. De Candolle and contemporaries proposed approximately 370 new specific names based wholly or in part on these paintings. Considerations regarding the formal typification of these taxa are outlined by Bartholomew and McVaugh (1997) and McVaugh (1998). The original set of paintings is now housed under the name of the Torner Collection of Sessé and Mociño Biological Illustrations at the Hunt Institute for Botanical Documentation (Carnegie Mellon University, Pittsburgh).

Some of these remarkably detailed paintings have remained without corroboration or reevaluation of their initial identifications, if such were ever made. We examined one of them (Torner No. 0884; Fig. 1), which includes on the same sheet two species of Asteraceae tribe Astereae, the left-hand one annotated by De Candolle as "*Lemerya anthemoides*" and the other as "*Grindelia angustifolia.*" It is assumed that the plants were encountered by the expedition in Mexico, as surmised from the identities of the plants depicted. The *Grindelia* illustration served as the basis for a formal description of the species in a publication by Michel-Félix Dunal in 1819 (see nomenclature below).

The left-hand plant is white-rayed, a species of *Aphanostephus.* Details at the top of the illustration, showing white ray flowers, disc corollas, and achenes, are from this plant. The slender taproot of annual duration, pinnatifid leaves, basally unexpanded disc corollas, and achenes with a conspicuous coronal pappus are features of *A. ramosissima* DC. var. *ramosus* (DC.) Turner & Birdsong (Turner, 1984), which occurs over a wide area of central Mexico, from Durango to San Luis Potosí and south to Michoacán, Guerrero, Morelos, and Veracruz.

The yellow-rayed plant (on the right-hand side) represents the species heretofore identified as *Gutierrezia alamanii* A. Gray, which is known from the south-central Mexican states of México and Morelos (Lane, 1985). Salient features shown in the illustration are these: a basally ascending stem arising from a fibrous-rooted rhizome; leaves linear-oblanceolate without a well-defined petiolar portion, 1-nerved, entire, primarily basally disposed but continuing up the stem; several relatively large heads (compared to other species of *Gutierrezia*) with conspicuous yellow rays (18, 21, and 23 rays, respec-

Figure 1. Illustrations of *Grindelia angustifolia* DC. ex Dunal = *Gutierrezia dunalii* (Sprengel) Nesom (right-hand plant, the holotype) and *Aphanostephus ramosissima* DC. var. *ramosus* (DC.) Turner & Birdsong (left-hand plant), as discussed in the text, photographed from Torner No. 0884 (Torner Collection of Sessé and Mociño Biological Illustrations, Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh, Pennsylvania).

tively, on the three mature heads illustrated); involucral bracts white on the proximal two-thirds, with prominent green tips. Heads of *G. alamanii* are 8–15 mm wide, excluding the rays; other species of the genus have heads (1–)2–8 mm wide (rarely to 10 mm in *G. conoidea* (Hemsley) M. A. Lane). The pappus of *G. alamanii* is an erose corona 0.1(–0.7) mm high. Because the illustrated plant was described as *Grindelia*, presumably its pappus was observed to be much reduced. However, all but one North American species of *Grindelia* are taprooted except for *G. oolepis* Blake from the Rio Grande Plains of southeastern Texas, which has slender, branched rhizomes. All species of *Grindelia* have serrate leaves, with either sharp-pointed or blunt-tipped teeth. The laterally oriented, fibrous-rooted rhizome and entire leaves of the illustrated plant eliminate it from consideration as a species of *Grindelia*. Species of *Gutierrezia* also are taprooted, except for *G. alamanii*, which is a "perennial, rhizomatous herb with basal rosettes at flowering; tap root branched, secondary roots prominent, the root system thus appearing fibrous" (Lane, 1985: 13). The clarity of the illustration in habit and diagnostic capitular features establish the identity of the yellow-rayed plant as *Gutierrezia alamanii* sensu stricto. (Comments on a closely related entity, *G. alamanii* var. *megalocephala* (Fernald) M. A. Lane, are given below.)

If *Grindelia angustifolia* DC. ex Dunal is treated as a *Gutierrezia*, the following new combination is necessary.

Gutierrezia dunalii (Sprengel) Nesom, comb. nov.
Basionym: *Grindelia dunalii* ["*Duvalii*"] Sprengel, Syst. veg. 3: 525. 1826. Nom. nov. for *Grindelia angustifolia* DC. ex Dunal, Mém. Mus. Paris 5: 51, plate 7 [cited as plate 3]. 1819. "Asteris species. Moç. et Sessé. fl. mex. ined." and "*Grindelia angustifolia*. D.C. ined." as cited by Dunal l.c., p. 52. "Asteris sp. Moç. fl. mex. ined." as cited by DC., in DC., Prodr. 5: 315. 1836; non *Grindelia angustifolia* Kunth, in HBK, Nov. Gen. & Sp. [folio] 4: 309. 1818; [quarto] 4: 309. 1820. TYPE: "Mexico." Torner No. 0884, the right-hand plant (holotype, Torner Collection of Sessé and Mociño Biological Illustrations, Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh, Pennsylvania).

Gutierrezia alamanii A. Gray, Smithsonian Contr. Knowledge 3(2): 91 [= Pl. Wright. 1: 91]. 1852. Nom. nov. for *Keerlia linearifolia* DC., in DC., Prodr. 5: 310. 1836; non *Gutierrezia linearifolia* Lagasca. 1816 (= *Gutierrezia sarothrae* (Pursh) Britton & Rusby, see Lane, 1982). *Xanthocephalum alamanii* (A. Gray) Bentham, in Bentham & J. D. Hooker, Gen. Pl. 2: 249. 1873. *Xanthocephalum linearifolium* (DC.) Greenman, Publ. Field Mus. Nat. Hist., Bot. Ser. 2: 345. 1912. TYPE: "Mexico." Without date, *Alaman s.n.* (holotype, G-DC not seen, microfiche-UNC; isotypes, GH fragment not seen, P not seen, photo of G-DC type-TEX).

The original of the holotype of *Gutierrezia dunalii* bears no inscription except for annotations by De Candolle, "*Lemerya anthemoides*" (for the left-hand plant, an unpublished name) and "*Grindelia angustifolia*" (for the right-hand plant). Presumably DC. plate 559, which is missing from the collection at Geneva, was a copy. No specimen corresponding to this was found in the Sessé and Mociño herbarium.

The illustration published by Dunal (plate 7, a black-and-white engraving) was reproduced from a copy made by the artist Node-Véran of the right-hand plant on Torner No. 0884.

Dunal (1819) cited "*Grindelia angustifolia* DC. ined.," suggesting that he (Dunal) was taking up an unpublished name, which currently would be credited to Dunal as the publishing author and formally cited either as "DC. ex Dunal" or simply "Dunal" (Greuter et al., 1994: Article 46.4). De Candolle, however (1836: 315), considered the name to originate from himself and wrote the primary citation of the name as "DC. in Dunal l.c. 1819." Sprengel created the substitute name *Grindelia dunalii* for *Grindelia angustifolia* DC. ex Dunal because of the earlier homonym *G. angustifolia* [Kunth in] HBK. In his monograph on North American *Grindelia*, Steyermark (1934) assigned *G. angustifolia* [Kunth in] HBK to the synonymy of *G. inuloides* Willdenow. Neither *Grindelia angustifolia* DC. nor *Grindelia dunalii* Sprengel was mentioned by Steyermark.

The Status of *Gutierrezia alamanii* var. *megalocephala*

Gutierrezia alamanii var. *megacelophala*, as treated by Lane (1985), occurs in the western Sierra Madre from west-central Chihuahua to southern Durango, the southernmost populations disjunct by more than 550 kilometers from populations of typical *G. dunalii* (= *G. alamanii*) in the states of México and Morelos. With recognition of the validity of the earlier name for *Gutierrezia alamanii*, a new name is now required for the sierran populations, provided here at specific rank.

Gutierrezia megalocephala (Fernald) Nesom, comb. nov. Basionym: *Xanthocephalum megalocephalum* Fernald, Proc. Amer. Acad. Arts 36: 505. 1901. *Gutierrezia alamanii* var. *megalocephala* (Fernald) M. A. Lane, Sida 8: 313. 1980. TYPE: Mexico. Chihuahua: Mt. Mohinora, 1 Sep. 1898, *E. W. Nelson 4890* (holotype, GH not seen; isotypes, GH not seen, US).

Lane's treatment of these two entities as varieties of a single species is reasonable. In a narrower species concept, however, and based on essentially the same evidence, they can also be justifiably regarded as species separated by the morphological, cytological, and geographical differences noted in the couplet below. Their treatment at specific rank emphasizes the isolation, both external by wide geographic disjunction and internal by genomic differences (diploid vs. tetraploid).

1a. Flowering stems 18–32 cm tall, basally decumbent to ascending (matching the Sessé & Mociño illustration); achenes 1.5–1.7 mm long; pappus a barely perceptible, toothed rim ca 0.05–0.2 mm high; plants diploid ($2n = 8$); states of México and Morelos . . . . . *G. dunalii*

1b. Flowering stems 24–70 cm tall, strictly erect from the base; achenes 2–2.5 mm long; pappus a corona of fused scales uneven in height around its circumference, 0.2–0.7 mm high; plants tetraploid ($2n = 16$); states of Chihuahua and Durango . . . . . *G. megacephala*

Acknowledgments. We are grateful to James J. White (Curator of Art, Hunt Institute for Botanical Documentation) for sending a color transparency of the illustration (Torner No. 0884), from which the identification was made, and to the staff at TEX (Austin) for help during recent study there. The color transparency has been deposited in the collections of reprints and other documentation for Compositae at TEX.

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A New Species of the Genus *Paederia* (Rubiaceae) from the Petriky Forest, Taolagnaro, Madagascar

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ABSTRACT. *Paederia taolagnarensis* Razafimandimbison & C. M. Taylor is described from Petriky, Taolagnaro, Madagascar. This new species is distinguished from other *Paederia* species of Madagascar by its cymose-paniculate inflorescences that are rather congested, showing "double" scorpioid cyme structure, and its thickened peduncles and pedicels. It grows on stabilized dunes in the Petriky region, Taolagnaro. A description and dichotomous key are provided.

RÉSUMÉ. *Paederia taolagnarensis* Razafimandimbison & C. M. Taylor a été décrite de la région de Petriky, Taolagnaro, Madagascar. Cette nouvelle espèce est distinguée des autres *Paederia* de Madagascar par ses inflorescences en panicule de cyme, qui sont plutôt arrondies et parfois ramifiées dichotomiquement, et ont des pédoncules et pédicelles épaisses. Elle pousse sur les dunes dans la région de Petriky, Taolagnaro. Sa description et une clé dichotomique ont été inclues.

The genus *Paederia* L. (Paederieae, Rubiaceae) is represented in Madagascar by about 12 species (Puff, 1991). Ten of these species are endemic to Madagascar, with two also found in the Mascarenes and on the African mainland. In his recent treatment of *Paederia* of Madagascar, Puff (1991) keyed and provided a morphological description for one specimen that appeared to be a new species, but he did not name this because that specimen had only fruits.

While identifying undetermined material of *Paederia* from Madagascar in the MO herbarium, we discovered a few herbarium specimens matching the undescribed species mentioned by Puff in his treatment of Madagascan *Paederia*. These specimens have flowers, allowing us to confirm that it is indeed undescribed. We describe this new species below.

Paederia L., belonging to the tribe Paederieae and subfamily Rubioideae, is a genus of lianas characterized by having an unpleasant odor when tissue is damaged, stamens inserted at two levels, and winged or unwinged diaspores (Puff, 1991). For taxa with winged diaspores, each diaspore is suspended from the stout, filiform carpophore, which remains basally attached to the top of the pedicel (Puff, 1991).

Paederia taolagnarensis Razafimandimbison & C. M. Taylor, sp. nov. TYPE: Madagascar. Toliara: Taolagnaro, also called Fort-Dauphin, region of Manambaro, Petriky forest, ca. 15 km W-SW of Taolagnaro on stabilized dune sand, 25°04′S, 46°51′E, 9 Mar. 1989, *R. Gereau, G. Schatz & N. Dumetz 3219* (holotype, MO 3766545; isotypes, P, TAN). Figure 1.

Haec species a congeneris madagascariensibus inflorescentia cymoso-paniculata congestiore interdum dichotome ramosa atque pedunculis pedicellisque crassis distinctur.

Lianas. Stems sparsely lenticellate, terete, ca. 2 mm diam., glabrous. Leaves decussate, widely ovate to widely oblong, 21–65 × 19–38 mm, rounded at base, rounded to acuminate or apiculate at apex, with 5 to 6 pairs of secondary veins, glabrous. Petioles 11–28 mm long, glabrous. Stipules interpetiolar, up to 1.5 mm long, triangular, appressed, densely pubescent on the distal part, apex acute or sometimes shallowly bifid. Inflorescences axillary, cymose-paniculate, rather congested, showing "double" scorpioid cyme structure, bearing 3 to 7 flowers; peduncles sparsely lenticellate, terete, 10–40 mm long, 0.7–1 mm diam., glabrous. Flowers 5-merous; pedicels terete, to 3 mm long, 0.5–0.6 mm diam.; receptacle glabrous. Calyx lobes 0.5–1 mm long, broadly triangular. Corolla tube whitish blue, infundibuliform, 8–10 mm long, ca. 1 mm diam., glabrous outside, inside glabrous below the middle and lanate above the middle, corolla lobes 2–3 mm, oblong, rounded and notched at apex, light purple with darker purple on base of the lobes, not rigid, margins crisped. Stamens inserted near the mouth of the corolla tube; filaments 0.04–0.08 mm, glabrous; anthers ca. 1.5 mm long, partially exserted. Style ca. 6 mm long; stigmas filiform. Ovary 2-loc-

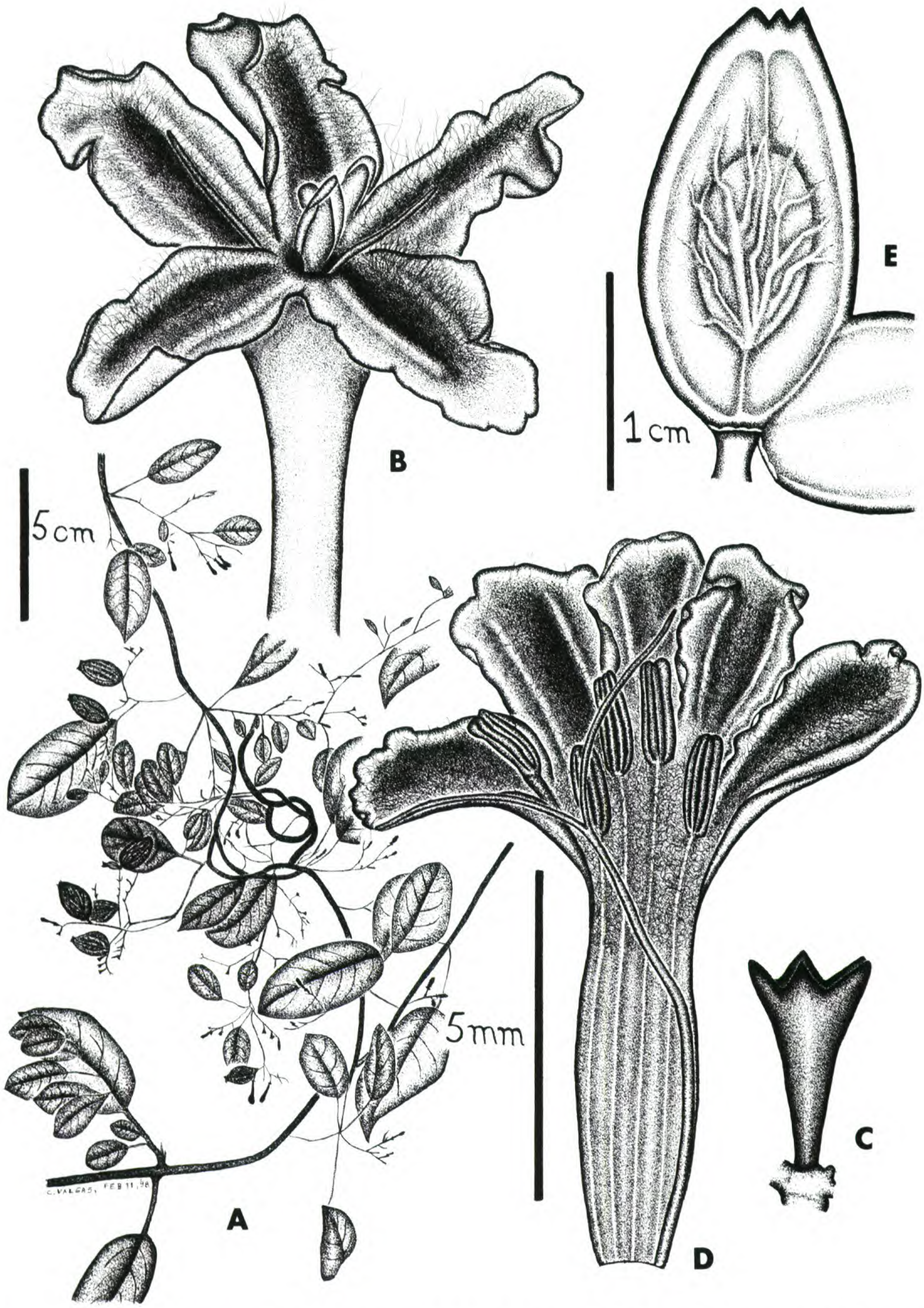

Figure 1. *Paederia taolagnarensis* Razafimandimbison & C. M. Taylor, based on *Gereau et al. 3219.* —A. Habit of plant in flower and fruit. —B. Corolla tube and parts of stigma and anthers. —C. Calyx and part of inflorescence. —D. Dissected corolla tube showing style and stigma as well as anther attachment. —E. Dissected fruit.

ular. Fruits 13–16 × 7–10 mm, laterally compressed, ovate-elliptic, glabrous, shiny, crowned by persistent calyx lobes; diaspores slightly smaller than fruit outline, wings ca. (1.5–)2–3 mm wide, seed-bearing portion 5.5–7 × 4–8 mm, black.

Distribution and habitat. *Paederia taolagnarensis* is only known from Petriky, Canton Manambaro, Taolagnaro, in the extreme southeastern corner of Madagascar, where it grows on stabilized sand dunes. These sands have a high titanium content and host other endemic species such as *Polyalthia pendula* LeThomas & Schatz (Annonaceae), *Kalanchoe rosei* R. Hamet & H. Perrier subsp. *serratifolia* Humbert (Crassulaceae), *Croton thouarsianum* H. Braun (Euphorbiaceae), *Tachiadenus longifolius* Scott Elliot (Gentianaceae), *Gladiolus decaryi* Goldblatt (Iridaceae), and *Cryptocarya elliotii* Kostermans (Lauraceae). *Paederia taolagnarensis* is apparently also restricted to this habitat.

This particular habitat is found only in Petriky, Mandena, and St. Luce, Taolagnaro, Madagascar. Mandena and Petriky have been proposed as the site of a large surface-mining project for titanium. This development would probably lead to the extinction of any species whose total geographic distribution is restricted to the mine path (Lowry & Faber-Langendoen, 1991).

Paratypes. MADAGASCAR. **Toliara:** Fort-Dauphin region, SE of town of Petriky, forest near dune near end of QIT road, 25°05′S, 46°52′E, 2 Nov. 1989, *McPherson 14355* (MO, P, TAN), 25 m, 8 Dec. 1989, *McPherson & Dumetz 14690* (MO, P, TAN), 12 Dec. 1989, *Dumetz & McPherson 1092* (MO, P, TAN); Fort-Dauphin, *Scott Elliott 3060* [P. sp. MAD A] (BM, E, K, P).

KEY TO *PAEDERIA TAOLAGNARENSIS* AND *P. SAMBIRANENSIS*

We present below only an update to the last parts of the key given by Puff (1991) for Madagascan *Paederia*, to be inserted in leads 11 and 11*, and incorporating the floral information of *P. taolagnarensis*:

11. Fruits (5.5–)6–11 mm long, wings of diaspores 0.5–2 mm wide 13
11*. Fruits (11–)13–20 mm long, wings of diaspores (1.5–)2–3 mm wide 12
12. Inflorescence lax, peduncles and pedicels filiform and slender, pedicels (3–)5–17 mm long, calyx lobes (0.7–)1–1.8 × 0.3–0.6 mm, narrowly triangular to subulate; only known from Sambirano region (NW Madagascar) . . . . . *Paederia sambiranensis*
12*. Inflorescence not so lax, penducles and pedicels coarser, pedicels to 1 mm long; calyx lobes 0.5–1 mm long, broadly triangular; only known from littoral forests of Petriky, Manambaro, and Taolagnaro (SE Madagascar) . . . . . *Paederia taolagnarensis*

Acknowledgments. We thank Roy Gereau for his help with the Latin description, P. Mick Richardson for his comments, and Nancy Hediger, who originally separated the unidentified specimens as new species. The fine illustration was drawn by Carlos Vargas, and its cost was borne by the Alumni Fund at MO.

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A New Species of the Fern Genus *Thelypteris* (Thelypteridaceae) from Southeastern Brazil

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ABSTRACT. *Thelypteris semirii*, known only from Minas Gerais, Brazil, is described and illustrated. The new species belongs to *Thelypteris* subg. *Goniopteris*, due to the indument of furcate and stellate trichomes on scales, petioles, rachises, and costae. It is most closely related to *T. scabra* (C. Presl) Lellinger (from Argentina, Paraguay, and southeastern Brazil) because of pinna shape, disposition of indument, prominent sinuses, and unbranched trichomes on sporangial stalks. It differs by having trichomes golden or orange, stipitate, and glandular, on both surfaces of all pinnae and indusia. Stems are erect and buds are lacking in the axils of distal pinnae.

Besides an early monograph by Christensen (1913) and the surveys of Brade (1972) and Sehnem (1979), nothing more on the taxonomy of the Brazilian species of the *Thelypteris* subg. *Goniopteris* (C. Presl) Duek has been published. This subgenus comprises 80 to 100 Neotropical species from Florida, the Antilles, and southern Mexico to northern Argentina and Paraguay (Smith, 1992). *Thelypteris* subg. *Goniopteris* is distinguished from other subgenera of *Thelypteris* by the presence of furcate or stellate trichomes on various plant parts, especially on the scales at the stem apex and in the adaxial groove of the rachis (Smith, 1983). Such trichomes are apparently lacking in a few species of subgenus *Goniopteris* (Smith, 1983, 1992), but are always present in Brazilian species. The major center of diversity for subgenus *Goniopteris* is Central America, where 41 species occur. Secondary centers are southeastern Brazil, Peru, and Ecuador. Brazil has approximately 29 species of subgenus *Goniopteris*, 21 of them occurring in the southeastern part of this country with at least 13 endemic to this region. In southeastern Brazil subgenus *Goniopteris* grows in mesic and moist shaded habitats, such as primary and secondary lowland and montane rainforests, from 0 to 1000 m, rarely reaching 1600 m. An exception is *Thelypteris lugubris* (Kunze ex Mettenius) R. Tryon & A. Tryon, which sometimes grows in open woods, along paths and weedy sites such as the understory of banana plantations. The present work provides the description of a new species and a key to the species of *Thelypteris* subg. *Goniopteris* of southeastern Brazil most closely related to this new species.

Thelypteris semirii Salino & Melo, sp. nov. TYPE: Brazil. Minas Gerais: Marliéria, Parque Estadual do Rio Doce, Campolina, Dec. 1996, *Salino 2848* (holotype, BHCB; isotypes, UC, UEC). Figure 1A–E.

Species nova subgeneris *Goniopteridis*, *Thelypteridi scabra* (C. Presl) Lellinger affinis, a qua pinnis trichomatibus glandulosis stipitatis abaxialiter vestitis et caule longo erecto differt.

Stems erect, with caudex to 15 cm long, scales lanceolate, brownish, with furcate and stellate trichomes, sometimes also with marginal glandular trichomes. Leaves clustered, 64–103 cm long, monomorphic. Petioles yellowish, sulcate on adaxial side, 30–55 × 0.2–0.3 cm, glabrescent to sparsely pilose, with furcate and stellate trichomes up to 1.5 mm long, also with lanceolate scales. Laminae 34–59 cm long, herbaceous to chartaceous, not verrucose, 1-pinnate to pinnatifid, apex gradually reduced, confluent and pinnatifid. Buds and aerophores absent. Rachises densely pilose in adaxial grooves, abaxially sparsely pilose with furcate and stellate trichomes, sometimes also with unbranched trichomes, abaxially sometimes stellate and furcate trichomes absent. Pinnae 11 to 20 pairs per leaf, sessile, 9–12 × 1.3–2 cm, linear-lanceolate, elliptic or lanceolate, with apex acuminate and base truncate or oblique; incised ca. ½ their width, with lowermost pinnae strongly deflexed, hair-like scales on abaxial side of costae. Segments 3–6 mm wide, falcate, with margins entire and apex round-

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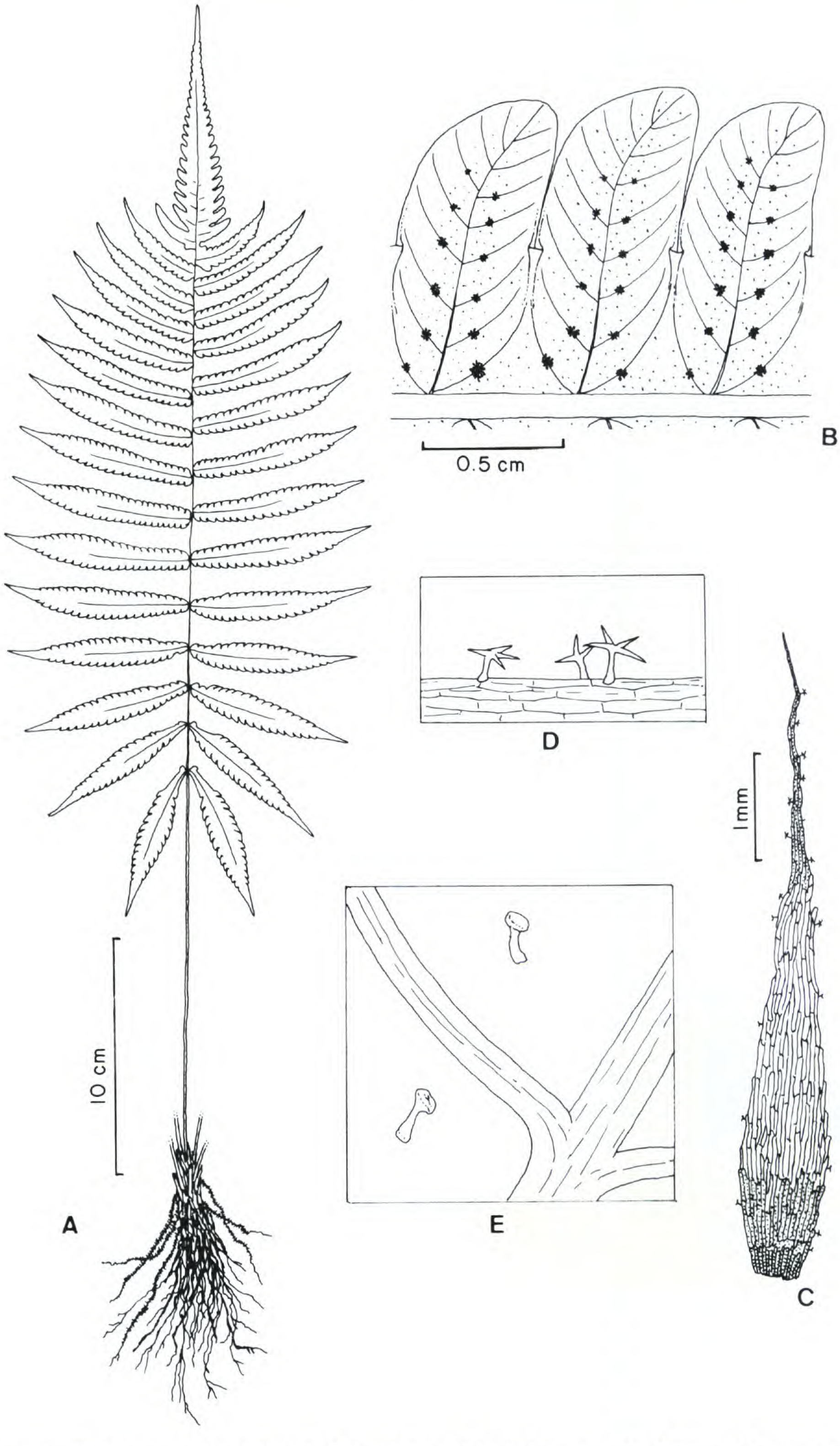

Figure 1. A–E. *Thelypteris semirii* Salino & Melo (*Salino 2848*, holotype). —A. Habit. —B. Segments, showing venation, soral position, and prominent sinuses. —C. Stem scale. —D. Detail of epidermis surface of petiole, showing stellate trichomes. —E. Detail of stalked glandular trichomes on abaxial side of laminar tissue.

ed, obtuse or acute, veins 6 to 11 pairs per segment, unbranched, lowermost vein pairs from adjacent segments running to or just above the sinus. Indument of furcate and stellate trichomes on scales, petioles, rachises, and costae; unbranched trichomes on petioles, rachises, costae, costules, and margins of segments, sometimes on veins and laminar tissue; golden or orangish, glandular, stalked trichomes on both surfaces of pinnae and indusia. Sori in medial to inframedial positions, indusia reniform, with margin repand, pale to brown, and glandular; sporangia glabrous, sometimes with unbranched trichomes on sporangial stalks.

Epithet. This plant is named in honor of João Semir (State University of Campinas, Brazil), who has greatly contributed to our knowledge of the Brazilian flora.

Distribution and habitat. *Thelypteris semirii* is endemic to the "Zona da Mata" region in the State of Minas Gerais, Brazil, and grows in shaded areas in the primary and secondary Atlantic Rain Forest, from 300 to 700 m. This new species is common only in the Rio Doce State Park, between 19°41′–19°30′S and 42°38′5″–48°28′W and is rare outside this region.

The new species belongs to *Thelypteris* subg. *Goniopteris*, due to the indument of trichomes furcate and stellate on scales, petioles, rachises, and costa. It is very similar to *T. scabra* (from Argentina, Paraguay, and southeastern Brazil) in pinna shape, indument disposition, prominent sinuses, and unbranched trichomes on sporangial stalks. However, *T. scabra* has creeping stems, buds in the axils of distal pinnae and lacks orangish, stalked, glandular trichomes on the abaxial side of costae, veins, laminar tissue, and indusia. *Thelypteris semirii* has an erect stem, lacks buds in the axils of distal pinnae, and has trichomes that are glandular, short-stalked, and orangish on abaxial sides of costae, veins, laminar tissue, and indusia. This new species differs from the other species of subgenus *Goniopteris* from Brazil by the presence of glandular trichomes. Other species of subgenus *Goniopteris* from Brazil are eglandular. However, *T. aureola* A. R. Smith (from Honduras) has numerous golden or orangish, short-stalked, glandular trichomes on the abaxial surfaces of rachises, costae, veins, and laminar tissue (Smith, 1990). *Thelypteris aureola* has exindusiate sori, and sporangia and receptacle glandular, while *T. semirii* has indusiate sori, and sporangia and receptacle without glandular trichomes.

Paratypes. BRAZIL. **Minas Gerais:** Astoldo Dutra–Guarani, às margens do Rio Pomba, 7 Apr. 1998, *Salino 4176* (BHCB); Marliéria, Parque Estadual do Rio Doce, Trilha do Vinhático, 16 May 1995, *Salino 2167* (BHCB, UC), 29 Mar. 1996, *Salino 2663* (BHCB), Campolina, 30 Mar. 1996, *Salino 2673* (BHCB), Ilha do Clei—porção norte, 22 June 1996, *Scudeller 456* (BHCB); Rio Casca, margens do Rio Casca, 28 Feb. 1998, *Salino 4079* (BHCB); Viçosa, Agricultural College lands, road to São Miguel, 19 Mar. 1930, *Mexia 4487-b* (GH, UC, US).

KEY TO THE SPECIES OF *THELYPTERIS* SUBG. *GONIOPTERIS* OF SOUTHEASTERN BRAZIL ALLIED TO *T. SEMIRII*

1a. Stem erect; trichomes orange, short-stalked, glandular on the abaxial costa, veins, laminar tissue, and indusia . . *T. semirii* (Brazil, Minas Gerais)
1b. Stem creeping; glandular trichomes absent.
  2a. Sori exindusiate.
    3a. Lamina with apex abruptly reduced, similar to lateral pinnae (conform); sporangial capsules with simple trichomes . . *T. tetragona* (Swartz) Small (from eastern and southern Mexico to Panama; Florida; the Antilles; Colombia to Peru and Surinam (Smith, 1992); Argentina (Ponce, 1987); north and southeastern Brazil (Salino, pers. obs.)
    3b. Lamina with apex gradually reduced, confluent and pinnatifid; sporangial capsules without trichomes.
      4a. Buds on axils of lowermost pinnae; base of medial pinnae, with acroscopic side not auriculate . . *T. abbiattii* C. F. Reed (from southeastern Brazil and Argentina)
      4b. Buds absent on axils of lowermost pinnae; base of medial pinnae, with acroscopic side auriculate, the auricle often overlapping the rachis . . . . . *T. riograndensis* (Lindman) C. F. Reed (from southeastern Brazil, Argentina, Paraguay, and Uruguay)
  2b. Sori indusiate.
    5a. Scales lanceolate on abaxial costa; adaxial laminar tissue pubescent; trichomes simple and furcate on abaxial veins . . *T. lugubris* (Kunze ex Mettenius) R. M. Tryon & A. F. Tryon (from southeastern and central Brazil)
    5b. Scales absent on abaxial costa; adaxial laminar tissue glabrous; trichomes absent on abaxial veins . . . . *T. scabra* (from southeastern Brazil, Argentina, and Paraguay)

Acknowledgments. We thank the curators of the following herbaria for loan of specimens and hospitality during visits: GH, UC, and US. We also thank Alan R. Smith for suggestions, Miryan Morato Duarte for preparation of illustrations, Claudia Maria Jacobi and two anonymous reviewers for suggestions and help with English.

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New Species and a New Name in *Palicourea* (Rubiaceae: Psychotrieae) from Northwestern South America

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ABSTRACT. The new species *Palicourea awa*, *P. clerodendroides*, *P. cogolloi*, *P. eburnea*, *P. garcioides*, and *P. glandulifera* are described and illustrated, and the variety *P. justicioides* var. *macrocalyx* M. C. G. Kirkbride is recognized as a species, *P. kirkbrideae*. These are all shrubs or small trees found in wet forests at 900–3040 m in Colombia and northwestern Ecuador.

RESUMEN. Las especies nuevas *Palicourea awa*, *P. clerodendroides*, *P. cogolloi*, *P. eburnea*, *P. garcioides* y *P. glandulifera* se describen e ilustran, y la variedad *P. justicioides* var. *macrocalyx* M. C. G. Kirkbride se trata como una especie, *P. kirkbrideae*. Todas estas especies son arbustos o árboles pequeños de bosque húmedo a 900–3040 m en Colombia y el noroeste de Ecuador.

Among recent collections from Colombia and northwestern Ecuador, the following undescribed species of *Palicourea* Aublet were represented. The characteristics, circumscription, and infrageneric classification of this genus have been presented previously (Taylor, 1997); the classification of each of these new species according to this system is noted at the end of each description. In brief, *Palicourea* is distinguished within the Rubiaceae by its persistent stipules that are united around the stems into a continuous sheath and bilobed in the interpetiolar portion; generally colored inflorescences with the flowers usually pedicellate; corollas that are usually brightly colored, usually five-lobed, and have well-developed tubes that are somewhat swollen at the base and glabrous internally except for a dense ring of pubescence situated just above this basal swelling; and drupaceous fruits with usually two pyrenes. This neotropical genus includes about 200 species found from sea level to high-montane regions. The species are typically distylous and apparently pollinated by hummingbirds. *Palicourea* is closely related to *Psychotria* subg. *Heteropsychotria* Aublet; *Psychotria* subg. *Heteropsychotria* is distinguished from *Palicourea* by its corollas that are not swollen at the base and internally are variously pubescent or glabrous but lack a defined ring of trichomes in the lower portion.

Palicourea awa C. M. Taylor, sp. nov. TYPE: Colombia. Nariño: municipio de Ricaurte, Resguardo Indígena Gualcalá, Santa Fe, camino al Río Gualcalá, 01°18′N, 77°54′W, 1100–1200 m, 18 Dec. 1995, *B. R. Ramírez P. & M. S. González 9164* (holotype, PSO; isotype, MO-4911397). Figure 1A, B.

Haec species a *Palicourea standleyana* C. M. Taylor stipularum vaginis truncatis ac lobulis angustis notatis, foliorum nerviis secundariis multioribus atque inflorescentiis corollisque purpureis violaceisve distinguitur.

Shrubs and small trees flowering at 0.5 m tall, to 4 m tall; stems quadrate, often becoming channeled with age, densely hirsutulous. *Leaves* paired; blades elliptic, 13–36 × 6.5–21 cm, at apex acute to acuminate with tips to 20 mm long, at base cuneate to obtuse and usually attenuate along the petiole, papyraceous, adaxially glabrous except densely hirsutulous along costa and often also on secondary veins, abaxially hirtellous, to densely so on costa and secondary veins; secondary veins 31 to 42 pairs, spreading, uniting in a well-marked, generally straight, submarginal vein 1–2 mm from margins, without or rarely with 1 weak intersecondary vein present between pairs of secondary veins, adaxially costa prominulous to plane and remaining venation plane, abaxially costa prominulous to prominent, secondary veins prominulous, and reticulated minor venation plane to thickened; margins distinctly cartilaginous; *petioles* 2.5–12.5 cm long, densely hirtellous; *stipules* hirtellous often becoming glabrescent, persistent, united around stem into a continuous truncate sheath 4–8 mm long, with angles thickened and extending to base of lobes, lobes narrowly triangular, 6–7 mm long, acute, entire to ciliolate. *Inflorescences* terminal, erect to perhaps deflexed, with panicles subsessile and often appearing "tripartite," pyramidal to rounded-corymbiform, 6.5–18 × 5.5–14 cm excluding corollas, with 4 to 5 pairs of developed secondary axes, the basalmost usually strongly reflexed, with flowers pedicellate and sessile in congested to clearly dichasial cymules of 3 to 7; bracts entire to ciliolate, acute, those subtending secondary axes ligulate to lanceolate, 7–10 mm long, those subtending pedi-

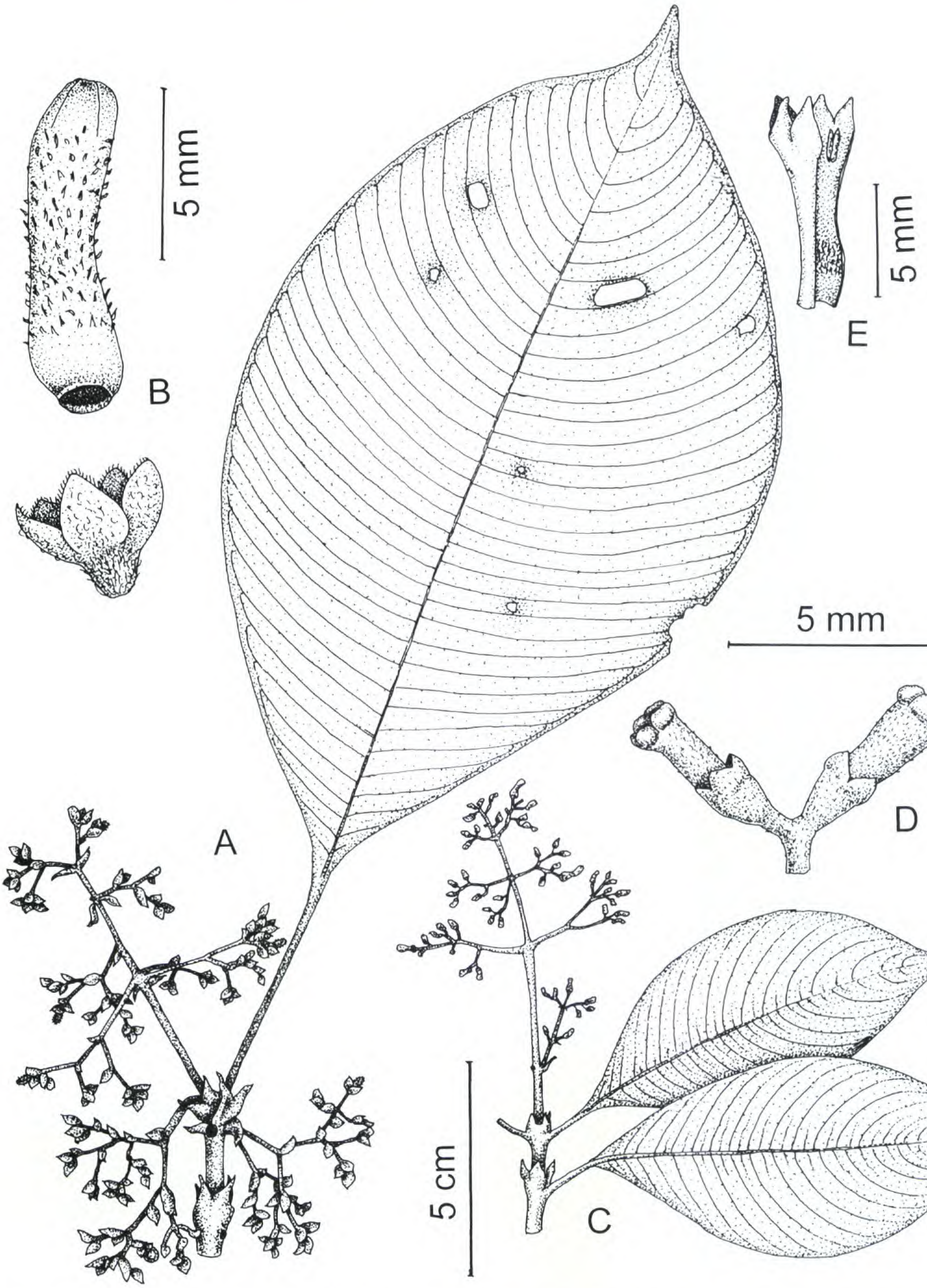

Figure 1. A, B, *Palicourea awa* C. M. Taylor. —A. Flowering branch, with inflorescence after anthesis; based on *Hoover 2735*. —B. Flower bud, partially dissected; based on *Ramírez & González 9164*. C–E, *Palicourea glandulifera* C. M. Taylor. —C. Flowering branch with inflorescence; based on *Andersson 2120*. —D. Cymule bearing flower buds with well-developed glandular regions on the abaxial surface of each corolla lobe. —E. Corolla at anthesis, partially dissected. D, E, based on *Gentry et al. 60375*. A, C to 5-cm scale.

cels ovate to elliptic, 4–6 mm long, pedicels to 6 mm long; peduncle, axes, bracts, and pedicels pilosulous to hirtellous, purple; *flowers* with hypanthium turbinate, ca. 1 mm long, hirsute; *calyx* limb hirtellous, 3–5 mm long, divided nearly to base, lobes deltoid to ovate, acute to obtuse, ciliolate, with lateral margins often overlapping; *corolla* in bud tubular-funnelform, purple to violet, a little swollen at base, straight at base and in tube, externally densely pubescent with stout trichomes to 1 mm long, internally glabrous except for a pilosulous ring ca. 1.5 mm wide situated just above basal swelling, tube ca. 8 mm long, lobes triangular, ca. 4 mm long, acute, not much thickened adaxially, in bud rounded, with sinuses not saccate at base; mature *anthers* and *stigma* not observed; disk ca. 1 mm high, annular. *Infructescences* similar to inflorescences; *fruits* ellipsoid, ca. 6.5 × 5.5 mm, hirtellous, purple-black to black; pyrenes 2, with one rather sharp, central, longitudinal ridge and 1 to 2 weak, rounded, longitudinal ridges on each side of this. [Subg. *Montane*, Sect. *Montanae*, Ser. 4, Subser. f]

Distribution, habitat, and phenology. In wet forest at 900–1450 m in northwestern Ecuador and adjacent southwestern Colombia; collected in flower bud in November and December, in fruit in January.

This species is distinguished by its hirtellous pubescence on all vegetative parts; leaves with relatively numerous secondary veins that unite into a well-marked submarginal vein; stipules united around the stem into a continuous, well-developed sheath; subsessile purple inflorescences with relatively well developed bracts and the basalmost secondary axes strongly reflexed; calyx limbs well developed with broad lobes; and corollas that are externally densely pubescent with stout multicellular trichomes. In general aspect it is similar to *Palicourea standleyana* C. M. Taylor, which can be distinguished by its secondary leaf veins 17 to 21 pairs, shallowly lobed to emarginate stipules, green inflorescences, and yellow corollas. The specific epithet honors the Awá people: this species is known only from their territory, which spans the Ecuador–Colombia border.

Paratypes. ECUADOR. **Carchi**: Maldonado, parroquia Tobar Donoso, Reserva Etnica Awá, Sabalera, 00°55′N, 78°32′W, *Aulestia et al. 718* (MO, QCNE); trail from Pailon to Gualpi Chico area of Awá Reservation, 1.5 km past Rio Blanco, 00°51′N, 78°16′W, *Hoover et al. 2425* (MO); trail along Awá border, to Mongon Creek, to W of encampment and ascending Creek Gualpi Chico area, 00°58′N, 78°16′W, *Hoover et al. 2569* (MO); Southeast Trail, in Gualpi Chico area near Awá encampment, 00°58′N, 78°16′W, *Hoover et al. 2735* (MO); near encampment in Gualpi Chico area of Awá Reserve, 00°58′N, 78°16′W, *Hoover et al. 2838* (MO).

Palicourea clerodendroides C. M. Taylor, sp. nov. TYPE: Ecuador. Zamora-Chinchipe: Cantón Nangaritza, Río Nangaritza, Pachicutza, 04°07′S, 78°37′W, 900 m, 3 Dec. 1990, *W. Palacios & D. Neill 6471* (holotype, MO-4328758). Figure 2A–C.

Haec species a *Psychotria gentryi* (Dwyer) C. M. Taylor limbi calycini longiores lobulis late rotundatis atque corolla flava longior distinguitur.

Flowering at 5 m tall, to 8 m tall; stems quadrate, glabrous. *Leaves* paired; blades elliptic, 21–34 × 8–20 cm, at apex acute to usually acuminate with tips to 10 mm long, at base acute to cuneate, papyraceous, adaxially glabrous, abaxially glabrous to hirtellous; secondary veins 11 to 17 pairs, spreading to ascending, broadly curved, usually extending to or nearly to margins or sometimes looping to interconnect in distal part of blade, with 1(to 3) weak intersecondary vein(s) usually present between pairs of secondary veins, adaxially venation plane or a little thickened, abaxially costa prominulous to prominent, secondary veins prominulous, and reticulated minor venation plane; margins thinly to distinctly cartilaginous; *petioles* 1–4 cm long, glabrous to hirtellous; *stipules* glabrous to hirtellous, persistent at least with leaves, united around stem in a continuous sheath 4–6 mm long, lobes 14–18 mm long, membranaceous, acute, triangular to lanceolate, fused for ca. ½, with sinus acute and side margins rounded at least at base, entire to ciliolate. *Inflorescences* terminal, erect, with peduncles 2–6.5 cm long, often with bracts subtending the basalmost pair of branches well developed and leaflike and the inflorescence thus appearing "tripartite"; panicles broadly pyramidal to corymbiform-rounded, 2.5–8 × 5–14 cm excluding corollas, with 2 to 3 pairs of developed secondary axes, with flowers pedicellate in cymules of 2 to 5; bracts ciliolate, those subtending secondary axes lanceolate to ligulate or ovate, 6–15 mm long, acute, those subtending pedicels lanceolate to elliptic, 3–6 mm long, obtuse to acute; pedicels 1–3 mm long; peduncle, axes, bracts, and pedicels hirtellous or pilosulous, yellow to red; *flowers* with hypanthium cylindrical to cupuliform, 2–3 mm long, hirtellous to glabrous; *calyx* limb glabrous, 4–7 mm long, shallowly lobed, lobes obtuse to rounded, ciliolate; *corolla* tubular-funnelform, yellow sometimes with lobes and upper portion of tube purple, a little swollen at base, generally straight at base and in tube, externally glabrous, internally glabrous ex-

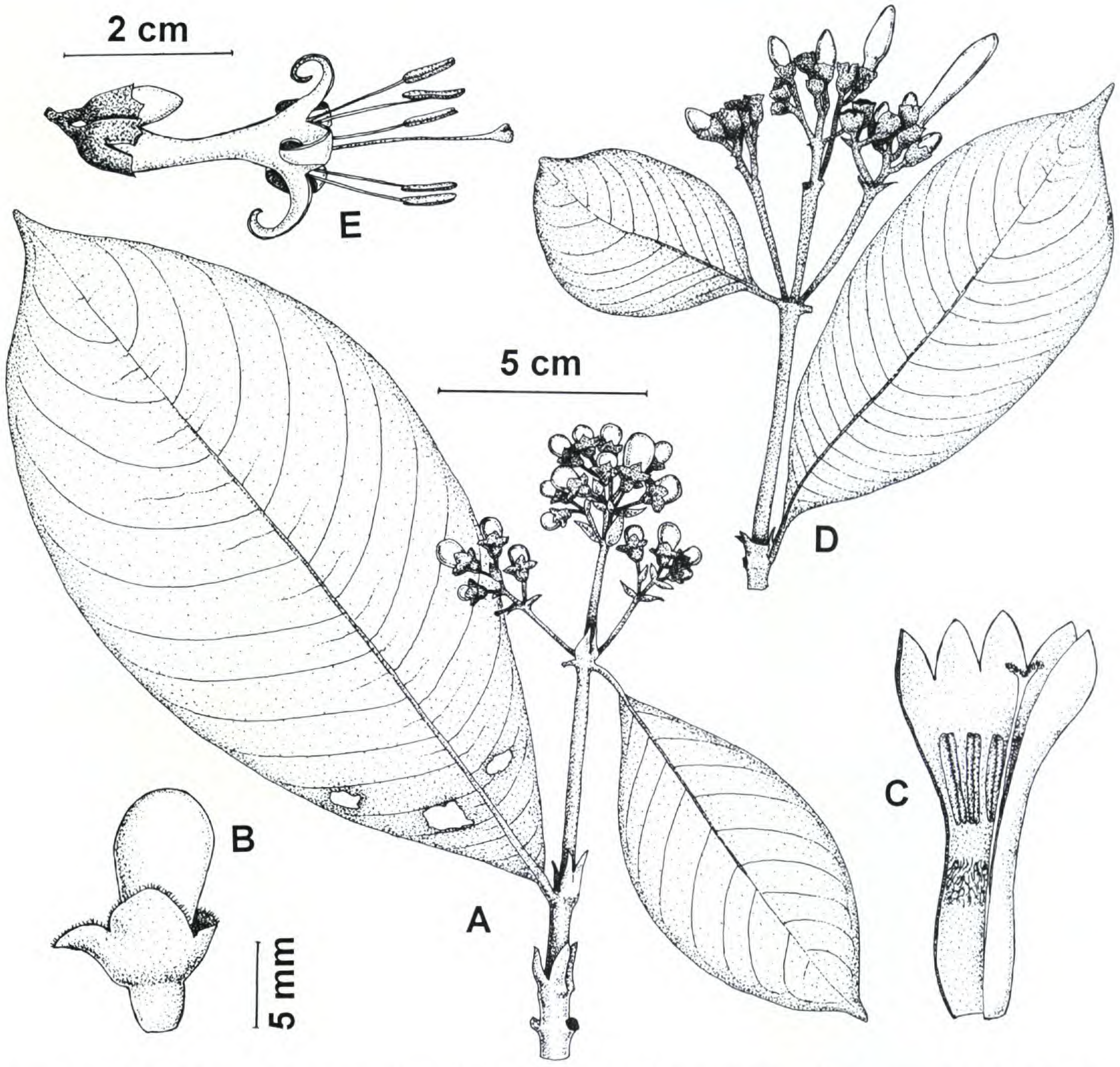

Figure 2. A–C, *Palicourea clerodendroides* C. M. Taylor, based on *Palacios 6471*. —A. Flowering branch with inflorescence. —B. Flower bud. —C. Corolla at anthesis, partially dissected. D, E, *Palicourea eburnea* C. M. Taylor, based on *Uribe 3408*. —D. Flowering branch with inflorescence. —E. Cymule of inflorescence with flower bud and flower at anthesis. A, D to 5-cm scale; B, C to 5-mm scale.

cept for a pilose ring ca. 3 mm wide at ca. 1 mm above base, tube ca. 27 mm long, ca. 7 mm diam. near middle, lobes deltoid, ca. 4 mm long, a little thickened adaxially, in bud rounded; *anthers* in apparent long-styled form ca. 6.5 mm long, positioned ca. ⅔ of length of corolla tube above base; *stigmas* in apparent long-styled form ca. 3 mm long and exserted; disk not seen. *Infructescences* and *fruit* not seen. [Subg. *Montanae*, Sect. *Montanae*, Ser. 4, Subser. f.]

Distribution and habitat. In wet forest at 900–1000 m, southern Ecuador. Collected in flower in October and December.

This species is distinguished by its relatively large stipules with the lobes triangular to lanceolate, broad to rounded inflorescences, and relatively large carnose flowers. The specific epithet refers to the similarity of this species in the general aspect of the inflorescences and flowers, including the well-developed, spreading calyx limb, to species of *Clerodendrum* L. (Verbenaceae), which can be separated by its superior ovary and lack of stipules. *Palicourea clerodendroides* appears to be related to *P. subalatoides* C. M. Taylor; *P. subalatoides* can be distinguished from *P. clerodendroides* by its stipules with sheaths 1.5–4 mm long and lobes 4–16 mm long; calyx limb 2–3 mm long; and yellow corollas with the tubes ca. 15 mm long and ca. 1.5 mm in diameter and the lobes ca. 5 mm long. *Palicourea clerodendroides* is also very similar in general as-

pect to *Psychotria gentryi* (Dwyer) C. M. Taylor, and these species have previously been confused *in herb. Psychotria gentryi* can be distinguished from *Palicourea clerodendroides* by its flowers sessile or subsessile in glomerules; corolla white or sometimes flushed with purple; corolla tubes ca. 10 mm long; corolla lobes ca. 10 mm long; and apparently allopatric geographic range, from Panama south to Ecuador on the western side of the Andes.

Paratypes. ECUADOR. **Zamora–Chinchipe:** Cantón Nangaritza, parroquia Pachicutza, sector noreste del campamento militar, *Jaramillo & Grijalva 13393* (NY, QCA); Cantón Nangaritza, Río Nangaritza, Pachicutza, 04°07′S, 78°37′W, *D. Neill 9489* (MO, QCNE); Cantón Nangaritza, Río Nangaritza, Pachicutza, camino al hito de Pachicutza, 04°07′S, 78°37′W, *Palacios et al. 8207* (MO, QCNE); Cantón Nangaritza, Miazi, margen derecha Río Nangaritza, 04°16′S, 78°42′W, *Palacios et al. 8630* (MO, QCNE).

Palicourea cogolloi C. M. Taylor, sp. nov. TYPE: Colombia. Chocó: municipio de San José del Palmar, SW of El Cairo along road from the Valle-Chocó limit to Finca La Florida, ca. 8 km from the limit on the old road to Río Blanco, 04°6′N, 76°21′W, 1800–2100 m, 30 Oct. 1996, *C. M. Taylor, W. Devia A. & J. Adarve 12012* (holotype, MO-4911399; isotypes, COL, JAUM, TULV). Figure 3A, B.

Haec species a *Palicourea apicata* Kunth stipularum vagina truncata ac lobulis angustis acutis distinguitur.

Flowering at (1)3 m tall, to 15 m tall; stems quadrate, glabrous. *Leaves* paired; blades elliptic, 6–15 × 1.6–8 cm, at apex acute to acuminate with tips to 8 mm long, at base acute to cuneate, chartaceous, adaxially glabrous and nitid, abaxially glabrous except appressed-puberulous along costa and secondary veins; secondary veins 7 to 11 pairs, usually extending to near or weakly uniting with margins, with 1 to 3 weak intersecondary veins usually present between pairs of secondary veins, adaxially costa prominulous and remaining venation thickened, abaxially costa prominulous to prominent, secondary veins prominulous, and reticulated minor venation thickened; margins thinly to distinctly cartilaginous, entire; *petioles* 5–15 mm long, glabrous; *stipules* glabrous, persistent at least with leaves, united around stem into a continuous truncate sheath 2–5 mm long, entire to ciliolate, lobes narrowly triangular to linear, 1.5–2.5 mm long, acute, entire. *Inflorescences* terminal, erect, with peduncles 0.2–4 cm long, sometimes with leaves or bracts subtending the basalmost pair of secondary axes well developed and the inflorescence appearing "tripartite"; panicles pyramidal, 11–16 × 10–11 cm excluding corollas, with 5 to 7 pairs of developed secondary axes, with the basalmost pair often strongly ascending and much longer than the other pairs, with flowers pedicellate in cymules of 3 to 7; bracts entire to ciliolate, acute to rounded, those subtending secondary axes narrowly triangular to deltoid, 1–5 mm long, those subtending pedicels deltoid to ligulate, 1–1.5 mm long; pedicels 1–3 mm long; peduncle, axes, bracts, and pedicels moderately to densely puberulous, blue-violet to purple; *flowers* distylous, with hypanthium glabrous, turbinate, ca. 1 mm long; *calyx* limb glabrous to puberulous, 0.4–1.2 mm long, deeply lobed, lobes triangular to deltoid, acute to rounded, ciliolate; *corolla* tubular-funnelform, purple to blue-violet, swollen and gibbous at base, bent ca. 90° at base and bent again just above basal swelling, generally straight in tube above this bend, externally glabrous, internally glabrous except for a pilosulous ring ca. 1 mm wide at ca. 1.5 mm above base, tube 6–8 mm long, ca. 2 mm diam. near middle, lobes triangular to ligulate, 2–3 mm long, acute, a little thickened adaxially and abaxially, in bud truncate, with sinuses not or slightly saccate at base; *anthers* in short-styled form ca. 3 mm long and partially exserted, in long-styled form ca. 2.5 mm long and positioned ca. ¾ of length of corolla tube above base; *stigmas* in short-styled form ca. 4 mm long and positioned ca. ¾ of length of tube above base, in long-styled form ca. 0.8 mm long and exserted; disk 1–1.2 mm high, annular. *Infructescences* similar to inflorescences; *fruit* ellipsoid, 4.5–5 × 4 mm, not flattened laterally, glabrous, purple to black; pyrenes with 3 to 5 low rounded longitudinal ridges. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

Distribution, habitat, and phenology. In wet forest at 1300–3040 m, Cordilleras Central and Occidental of Colombia. This species has been collected in flower in March, April, June, August, October, November, and December, and in fruit in January, February, March, May, June, October, and December.

This species is distinguished by its stipules with well-developed truncate sheaths and narrow lobes; rather stiff shiny leaves; pyramidal purple to blue-violet inflorescences; blue-violet to purple corollas that are strongly gibbous and bent at the base and have relatively short tubes; and relatively small ellipsoid fruits. *Palicourea cogolloi* is similar to *P. apicata* Kunth; *P. apicata* can be distinguished from *P. cogolloi* by its interpetiolar stipules with shallow broad lobes and its broader, usually rounded inflorescences. *Palicourea cogolloi* is also similar to *P. angustifolia* Kunth; *P. angustifolia* can be

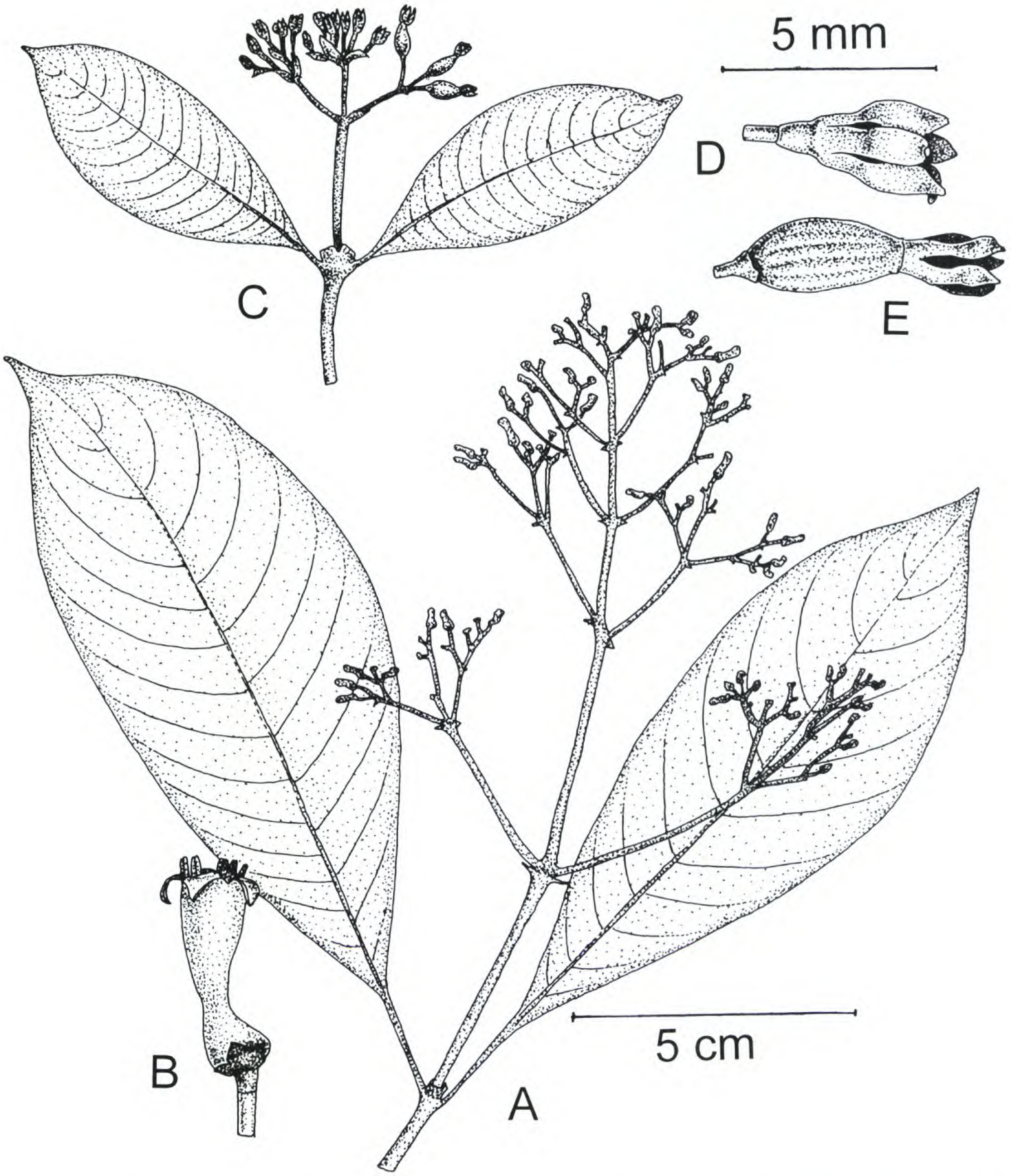

Figure 3. A–B. *Palicourea cogolloi* C. M. Taylor, based on *Cárdenas et al. 3172*. —A. Flowering branch with inflorescence. —B. Flower at anthesis. C–E. *Palicourea garcioides* C. M. Taylor, based on *Andersson et al. 2124*. —C. Flowering branch with inflorescence after anthesis, with developing fruits. —D. Calyx limb and hypanthium after anthesis. —E. Developing fruit. A, C to 5-cm scale; B, D, E to 5-mm scale.

distinguished from *P. cogolloi* by its corollas that are generally straight or only a little bent at the base and have tubes 14–15 mm long. This new species has frequently been confused with both *P. apicata* and *P. angustifolia in herb. Palicourea cogolloi* has been collected frequently in recent years by Colombian botanists, in particular by Alvaro Cogollo and his colleagues and students at JAUM; the species epithet honors this productive and knowledgeable scientist.

Paratypes. COLOMBIA. **Antioquia:** bajo de la cumbre cerca de Santa Elena, camino entre Medellín y Río Negro, *Barkley et al. 383* (MEDEL), *Gutiérrez 1063* (MEDEL), *1145* (MEDEL); municipio de Jardín, Alto de Ven-

tanas 15 km SO de Jardín en la vía a Riosucio, 05°30′N, 75°50′W, *Callejas et al. 3910* (HUA, MO); municipio de Urrao, Parque Nacional Natural "Las Orquídeas," sector Cabaña de Calles, quebrada La Agudelo, 06°31′N, 76°19′W, *Cárdenas et al. 3172* (JAUM, MO); municipio de Urrao, vereda Calles, Parque Nacional Natural "Las Orquídeas," margen derecha del río Calles, 06°32′N, 76°19′W, *Cogollo et al. 4109* (JAUM, MO), *Pipoly et al. 17127* (JAUM, MO), en el filo al NO de la Cabaña de Calles, *Cogollo et al. 6466* (JAUM, MO), *6479* (JAUM, MO), *6984* (JAUM, MO), *7012* (JAUM, MO), *7135* (JAUM, MO), *Pipoly et al. 16566* (JAUM, MO), 06°29′N, 76°14′W, *Pipoly et al. 16719* (JAUM, MO); municipio de Enviagado, vertiente occidental, margen izquierda de la Miel, Fuente de Higueron, 06°19′N, 75°35′09″W, *Correa et al. 452* (JAUM, MO); Belmira, *Espinal 3* (MEDEL); Alto de Sapa, NW of Vega del Inglés, Paramillo National Park, 07°10′N, 75°54′W, *Gentry & Cuadros 79076* (MO); municipio de Urrao, páramo de Frontino, El Río, *Londoño et al. 152* (MEDEL, MO). **Cauca:** municipio de El Tambo, Parque Nacional Munchique, trail to Nueva Granada, 02°43′N, 76°58′W, *Andersson et al. 2126* (GB, MO, S). **Chocó:** municipio de San José del Palmar, vereda de Río Negro, Cerro Torrá, vertiente oriental, hoya del río Negro, *Ramos et al. 1283* (CUVC, MO), *1286* (CUVC, MO), cerca de 1 hora arriba del helipuerto, 04°46′N, 76°29′W, *Ramos et al. 1348* (CUVC, MO); municipio de San José del Palmar, Cerro del Torrá, vertiente nororiental, plan grande abajo de la cumbre, *Silverstone-Sopkin et al. 1783* (CUVC, MO); municipio de San José del Palmar, Cerro del Torrá, cumbre del Torrá Grande, *Silverstone-Sopkin et al. 1816* (CUVC, MO); municipio de San José del Palmar, vereda de Río Negro, Cerro Torrá, vertiente oriental, mesa y vecindad abajo de la cumbre, *Silverstone-Sopkin et al. 4452* (CUVC, MO); municipio de San José del Palmar, SW of El Cairo along road from the Valle-Chocó limit to Finca La Florida, ca. 8 km from the limit on the old road to Río Blanco, 04°46′N, 76°21′W, *Taylor et al. 12020* (MO, TULV). **Valle del Cauca:** municipio de Cali, Km 18 y Km 20 de la carretera de Cali a Buenaventura entrando por la Finca Zíngara, *Cabrera & van der Werff 15793* (MO); municipio de Cali, corregimiento de La Elvira, Cordillera Occidental, Finca Zíngara, Km 18 de la carretera Cali-Buenaventura, Km 4 vía a Dapa, 03°30′N, 76°34′W, *Giraldo-Gensini & Agredo 550* (MO, TULV), *711* (MO, TULV); municipio de El Cairo, Cerro del Inglés, Cordillera Occidental, Serranía de los Paraguas, a 1 hora en jeep de El Cairo, *Silverstone-Sopkin 2696* (CUVC, MO), *2800* (CUVC, MO).

Palicourea eburnea C. M. Taylor, sp. nov. TYPE: Colombia. Boyacá: Duitama, carretera de Virolín, Hacienda de La Rusia, 2600–2800 m, 14 Nov. 1945, *L. Uribe Uribe 1083* (holotype, COL; isotype, MO-5006421). Figure 2D, E.

Haec species a congeneris limbo calycino 3–6 mm longo, limbo calycino sinuato vel leviter lobato, corolla alba infundibuliformi extus dense lanosa atque filamentis styloque sat longis distinguitur.

Flowering at 2 m tall; stems quadrate, hirtellous to glabrescent. *Leaves* paired; blades elliptic to somewhat oblanceolate, 7.5–16 × 2.8–7 cm, at apex acute to acuminate with tips to 10 mm long, at base acute to usually cuneate or sometimes obtuse, papyraceous to chartaceous, adaxially glabrous, abaxially sparsely hirtellous on lamina and moderately to densely so on costa and secondary veins; secondary veins 11 to 17 pairs, spreading, usually extending to unite at least weakly with margins, with 1 to 2(3) rather weak intersecondary veins usually present between pairs of secondary veins, adaxially costa prominulous and remaining venation plane, abaxially costa prominulous to prominent, secondary veins prominulous, and reticulated minor venation plane to thickened; margins distinctly cartilaginous, ciliate; *petioles* 8–25 mm long, hirtellous; *stipules* hirtellous to glabrescent, persistent at least with the leaves, united around the stem into a continuous truncate sheath 4–8 mm long, lobes narrowly triangular to linear, 2.5–5 mm long, acute, entire to ciliolate. *Inflorescences* terminal, erect, with panicles subsessile and appearing "tripartite," rounded-corymbiform, 5–8 × 6–12 cm excluding corollas, with 2 to 3 pairs of developed secondary axes, with flowers pedicellate in cymules of 2 to 5; bracts entire to ciliolate, acute, those subtending secondary axes narrowly triangular, 4–5 mm long, those subtending pedicels triangular to deltoid, 0.5–1.5 mm long, often displaced distally along pedicel; pedicels 2–5 mm long; peduncle, axes, bracts, and pedicels glabrous or the bracts sometimes hirtellous; *flowers* with hypanthium glabrous, turbinate, 3–4 mm long; *calyx* limb glabrous, 3–6 mm long, sinuate to very shallowly lobed, lobes broadly obtuse, entire; *corolla* funnelform, white, somewhat swollen at base, straight at base and in tube, externally glabrous at base but for most of its length densely lanose with rather stout trichomes to 0.1 mm long, internally glabrous except for a pilose ring ca. 4 mm wide at ca. 5 mm above base, tube ca. 16 mm long, ca. 3 mm diam. near middle, ca. 10 mm diam. at throat, lobes ligulate, ca. 16 mm long, obtuse to acute, not much thickened adaxially, in bud rounded, with sinuses not saccate; *anthers* ca. 7.5 mm long, exserted on filaments ca. 14 mm long that are inserted at top of corolla tube; *stigmas* ca. 1.5 mm long, exserted on style ca. 35 mm long; disk ca. 2 mm high, annular. *Infructescences* similar to inflorescences; *fruit* ellipsoid, ca. 10 mm diam., not flattened laterally, glabrous, color not observed; pyrenes 2, with 3 to 5 rather sharp longitudinal ridges. [Provisionally: Subg. *Montanae*, Sect. *Psychotrioides*, Ser. 9.]

Distribution, habitat, and phenology. In wet forest at 2600–3000 m in the Cordillera Oriental

of the Andes in Colombia; collected in flower in March, October, and November, in fruit in November.

This species is distinguished by its stipules united around the stem into continuous truncate sheaths; subsessile rounded-corymbiform inflorescences; well-developed but truncate or very shallowly lobed calyx limb; pyrenes with sharp longitudinal ridges; broadly funnelform corollas that are externally densely but shortly lanose; and well-exserted anthers and stigmas. In general aspect it is similar to *Palicourea candida* C. M. Taylor; *P. candida* can be distinguished from *P. eburnea* by its stipules that are interpetiolar and floral bracts 3–7 mm long. The specific epithet refers to the color of the flowers, which are described on one label (*Uribe 3408*) as "*blanco de nieve*" (i.e., "snow white").

The relationships of this new species within *Palicourea* are not entirely clear, and it is classified only provisionally here. The floral morphology seen on herbarium specimens suggests that this species is homostylous, with the stigma and anthers both strongly exserted and held at nearly the same level. However, the number of flowering specimens available for study is relatively small, and the flowers on these dried specimens appear to be shrunken, so the corolla sizes and proportions given here may be smaller than those of living plants.

Paratypes. COLOMBIA. **Boyacá:** El Huerto, *Espinal et al. 1569* (MEDEL); Hacienda de la Rusia, en la carretera de Duimata a Charalá, *Uribe 3408* (COL).

Palicourea garcioides C. M. Taylor, sp. nov. TYPE: Colombia. Cauca: municipio El Tambo, Parque Nacional Munchique, trail to Nuevo Granada, 02°43′N, 76°58′W, 2000–2300 m, 14 Apr. 1994, *L. Andersson, F. González, C. Gustafsson, C. Persson & J. H. E. Rova 2124* (holotype, S; isotypes, GB, MO-4895911, NY). Figure 3C–E.

Haec species a *Palicourea garciae* Standley stipulis truncatis elobatis, limbo calycino 2–5 mm longo atque fructu ca. 5.5. × 2 mm distinguitur.

Flowering at 5 m tall; stems quadrate, hirtellous to glabrescent. *Leaves* paired; blades elliptic, 5–8.5 × 1.6–2.2 cm, at apex acute to acuminate with tips to 10 mm long, at base acute to usually cuneate, papyraceous, adaxially glabrous except hirtellous along costa, abaxially glabrous except strigulose to hirtellous along costa and secondary veins; secondary veins ca. 12 pairs, spreading, usually extending to unite at least weakly with margins, with 1(2) weak intersecondary veins usually present between pairs of secondary veins and minor venation not evident, adaxially costa prominulous and remaining venation plane, abaxially costa prominulous to prominent, secondary veins prominulous, and remaining venation plane; margins thinly to distinctly cartilaginous, entire; *petioles* 3.5–7 mm long, sparsely hirtellous to glabrous; *stipules* glabrous, persistent at least with leaves, united around the stem into a continuous, truncate to shallowly emarginate sheath 4–5 mm long, entire. *Inflorescences* terminal, erect, with peduncles 5–35 mm long, sometimes with the leaves or bracts subtending the basalmost pair of branches rather well developed and inflorescences appearing "tripartite"; panicles pyramidal, 3–4 × 4–7 cm excluding corollas, with 2 to 4 pairs of developed secondary axes, with flowers pedicellate in cymules of 3 to 5; bracts ligulate, entire to ciliolate, those subtending secondary axes 3.5–5 mm long, obtuse to truncate, those subtending pedicels 2.5–4 mm long, acute; pedicels 1–5 mm long; peduncle, axes, bracts, and pedicels greenish white, sparsely hirtellous or bracts usually glabrous; *flowers* with hypanthium cylindrical, ca. 1 mm long; *calyx* limb glabrous, 2–5 mm long, divided nearly to base, lobes ligulate, acute to obtuse, entire; *corolla* in bud tubular, pale yellow, a little swollen at base, straight at base and in tube, externally glabrous, internally glabrous except for a pilose ring just above base, tube ca. 2 mm long, lobes triangular, ca. 2 mm long, a little thickened adaxially, in bud rounded, with sinuses not saccate; mature *anthers* and *stigmas* not seen; disk ca. 1 mm high, annular. *Infructescences* similar to inflorescences; *fruit* narrowly ovoid, ca. 5.5 × 2 mm, flattened laterally, glabrous, dark purple; pyrenes 2, with 3 to 5 low rounded longitudinal ridges. [Subg. *Montanae*, Sect. *Psychotrioides*, Ser. 8.]

Distribution, habitat, and phenology. In wet forest at 2000–2300 m in the southern Cordillera Occidental of the Andes in southwestern Colombia.

This species is distinguished by its stipules that are united around the stems into truncate to shallowly emarginate sheaths; rounded-corymbiform inflorescences with relatively well developed floral bracts; well-developed calyx limbs; and relatively narrow fruits. It is similar to *Palicourea garciae* Standley; *P. garciae* can be distinguished from *P. garcioides* by its emarginate to shallowly bilobed stipules, bracts subtending the pedicels 1–1.5 mm long, calyx limb 0.8–1.2 mm long, and fruit ca. 5 mm wide. The specific epithet refers to the similarity of this new species to *P. garciae*. *Palicourea garcioides* is currently only known from the type collection, which was made in a poorly explored region in western Colombia.

Palicourea glandulifera C. M. Taylor, sp. nov. TYPE: Colombia. Nariño: La Planada Reserve, 7 km from Chucunés, 01°05′N, 78°01′W, 1800–1850 m, 4 Jan. 1988, *A. Gentry, O. de Benavides & P. Keating 60375* (holotype, PSO; isotypes, COL, MO-4895912). Figure 1C–E.

Haec species a congeneris stipulis sat bene evolutis, lobulis corollinis in alabastro extus glandularibus atque fructu obovoideo porcis longitudinalibus acutis ornato distinguitur.

Shrubs and small trees flowering at 2.5 m tall, to 4 m tall; stems quadrate, hirtellous to glabrescent. *Leaves* paired; blades elliptic to oblanceolate, 9.5–24 × 5–11 cm, at apex acute to acuminate with tips to 1 cm long, at base cuneate to usually acute, papyraceous, adaxially glabrous except hirtellous on costa, abaxially sparsely hirtellous throughout to densely so along costa and secondary veins; secondary veins 13 to 21 pairs, spreading, broadly curved, usually extending to unite with margins or sometimes reticulated or looping to interconnect near or at margins, with 1(2) well-marked to weak intersecondary veins usually present between pairs of secondary veins, adaxially costa and secondary veins plane to thickened and remaining venation plane, abaxially costa prominulous to prominent, secondary veins prominulous, and reticulated minor venation plane to thickened; margins thinly cartilaginous; *petioles* 1.5–3 cm long, hirtellous; *stipules* hirtellous, persistent at least with leaves, united around stem into a continuous sheath or with intrapetiolar portion often reduced, interpetiolar portion with a truncate to concave sheath 4–6 mm long, lobes triangular to deltoid, 3–5 mm long, acute, ciliolate. *Inflorescences* terminal, erect, with peduncles 1–5 cm long; panicles pyramidal, 6–9.5 × 7–9.5 cm excluding corollas, with 6 to 8 pairs of developed secondary axes, with flowers pedicellate in cymules of 3 to 7; bracts ciliolate, triangular to elliptic, obtuse to acute, those subtending secondary axes 1–2 mm long, those subtending pedicels 0.8–1 mm long; pedicels 1–1.5 mm long; peduncle, axes, bracts, and pedicels puberulous to strigulose or hirtellous, whitish green; *flowers* distylous, with hypanthium turbinate, ca. 1 mm long, puberulous; *calyx* limb glabrous to hirtellous, 1–1.2 mm long, divided deeply, lobes triangular to deltoid, entire; *corolla* funnelform, white, a little swollen at base, straight at base, straight to somewhat curved in tube, externally glabrous to densely puberulous or hirtellous, internally glabrous except for a pilose ring ca. 1.5 mm wide at ca. 2 mm above base, tube ca. 8 mm long, 1–1.5 mm diam. near middle, lobes triangular, ca. 3.5 mm long, acute, not or a little thickened adaxially at apex, in bud rounded and with a glandular area ca. 1 mm diam. in the upper middle of the abaxial side (Fig. 1D); *anthers* in short-styled form ca. 2.5 mm long, partially exserted, in long-styled form ca. 3 mm long, positioned ca. ⅓ of length of corolla tube above base; *stigmas* in short-styled form ca. 2 mm long and positioned ca. ½ of length of corolla tube above base, in long-styled form ca. 1 mm long and exserted; disk 1–1.2 mm high, annular. *Infructescences* similar to inflorescences or branches sometimes more spreading; *fruit* obovoid, ca. 7 × 5.5 mm, not flattened laterally, glabrous, blue; pyrenes with 3 to 5 sharp longitudinal ridges. [Subg. *Montanae*, Sect. *Obovoideae*, Ser. 6.]

Distribution and habitat. In wet forest at 1600–2300 m, in southwestern Colombia. Collected in flower in January, April, May, July, and November, and in fruit in November.

This species is distinguished by its relatively well developed, sheathing or often nearly interpetiolar stipules; corollas with glandular areas on the external surface of the lobes in bud (Fig. 1D); obovoid fruits; and pyrenes with rather sharp longitudinal ridges. It has been confused with *Psychotria levis* (Standley) C. M. Taylor of Peru. *Psychotria levis* also has corolla lobes that are apparently glandular on the abaxial surfaces in bud, but it can be distinguished from *Palicourea glandulifera* by its corollas with tubes 2–3 mm long and straight at the base; ellipsoid fruits ca. 4 × 2.5 mm; and broadly angled pyrenes. *Palicourea glandulifera* and *Psychotria levis* have both been confused *in herb.* for many years with a species of *Psychotria* from Ecuador that is apparently undescribed; this apparently undescribed species can be distinguished from both *Palicourea glandulifera* and *Psychotria levis* by its lack of abaxial thickenings or glandular areas on the corolla lobes in bud.

Paratypes. COLOMBIA. **Cauca:** municipio El Tambo, Parque Nacional Munchique, trail to Nueva Granada, 02°43′N, 76°58′W, *Andersson et al. 2120* (GB, MO, NY, S). **Nariño:** municipio de Ricaurte, corregimiento Chuchunéz, Reserva Natural La Planada, 7 km al sur de Ricaurte en el camino Tumaco–Pasto, 01°10′N, 77°58–59′W, *Barreto et al. 165* (MO), *de Benavides 5659* (MO, PSO), *Giraldo 64* (HUA), *Restrepo 437* (MO), *461* (MO), *695* (MO); trail from La Planada to Pielapi, 01°04′N, 78°02′W, *Gentry et al. 63605* (MO).

Palicourea kirkbrideae C. M. Taylor, stat. et nom. nov. Replaced name: *Palicourea justicioides* var. *macrocalyx* M. C. G. Kirkbride, Mutisia 47: 3. 1980, not *Palicourea macrocalyx* Standley, 1928. TYPE: Colombia. Cundinamarca: Cordillera Oriental, Las Cascadas, S side of Guavio River, 18 km NE of Gachalá, 1950 m, 29 Oct. 1944, *M. L. Grant 10526* [holotype, US-2339102, photo (no neg. #) MO-2782281; isotypes, COL, NY, WIS].

In her original description of this species, García-Kirkbride accurately noted the similarities between this species and *Palicourea justicioides* Standley and considered them conspecific. The plants she described as a variety of *P. justicioides* are here considered a distinct species and given a replacement epithet that honors her. *Palicourea kirkbrideae* is distinguished from *P. justicioides* by its secondary veins that are prominulous on the adaxial leaf surface; peduncles 8–9.5 cm long; purple inflorescence bracts and calyx limbs; calyx limbs ca. 9 mm long; corolla tubes ca. 30 mm long; and corolla lobes each with a linear projection 6–7 mm long borne from the adaxial surface. In contrast, *P. justicioides* has the secondary veins plane on the adaxial leaf surface; peduncles 0.6–2.5 cm long; apparently green inflorescence bracts and calyx limb; calyx limb 3.5–4 mm long; corolla tubes 16–20 mm long; and corolla lobes unappendaged. *Palicourea kirkbrideae* is classified in Subg. *Montanae*, Sect. *Montanae*, Ser. 4, and provisionally in Subser. 4 pending discovery of its fruits.

Acknowledgments. I thank the curators of COL, CUVC, F, GB, HUA, JAUM, MEDEL, NY, PSO, TULV, S, US, and WIS for the loan and gift of specimens; R. E. Gereau for preparation of the Latin diagnoses; and my colleagues in Colombia, in particular Wilson Devia and Alvaro Cogollo, for their generous help with logistics and information.

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Validation of the Name *Zingiber koshunense* (Zingiberaceae), a Species Endemic to Taiwan

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ABSTRACT. During preparation of the account of Zingiberaceae for the *Flora of China*, volume 24, it was noticed that one species, *Zingiber koshunense* Hayata, reported from Taiwan in 1930, was invalidly named because no description was provided. The species was later described in 1978 as *Z. koshunense* Hayata ex C. T. Moo, but the name remained invalid because, although two specimens were cited, there was no indication of a type. The name is here validated, with one of these specimens designated as the holotype.

Zingiber koshunense will be accepted as a species endemic to Taiwan by Wu and Larsen in their forthcoming account of Zingiberaceae in the *Flora of China*, volume 24 (in press). It is similar to *Z. kawagoi* Hayata (1921: 35), which is also endemic to Taiwan, but differs in usually having 2 or 3 (vs. 1) inflorescences, an orange-red, oblong (vs. dark brown, triangular) capsule, and brown (vs. black) seeds with a saclike (vs. cushion-like) aril. *Zingiber koshunense* was not treated by Wu and Chen (1981) in their account of Chinese *Zingiber*, but instead was mentioned in a short note (p. 140) stating that no specimens had been seen.

A nomenclatural problem exists for this species. Sasaki (1930: 139), in his catalogue of the Government Herbarium in Taiwan (TAIF), listed "*Zingiber koshunensis* [sic] Hayata," citing the specimen *T. Kawakami & S. Sasaki*, TAIF specimen no. 6461 from "The Ahi-sen Central Mt. Range" of Taiwan. He attributed the name to Hayata, although no earlier publication of the name by that author could be traced. Sasaki (1930) provided no description, so his publication of the name was invalid (a nomen nudum) under Article 32.1(c) of the *Tokyo Code* (Greuter et al., 1994). The same name was later accepted in the *Flora of Taiwan* by Moo (1978: 850), and explicitly described as a new species, with the name (but not the description) ascribed to Hayata (i.e., "Hayata ex C. T. Moo," Art. 46.4). However, *Z. koshunense* still remained invalidly published because no single collection or illustration was indicated by Moo as the type (Arts. 8.1, 37.1). Moo cited in his treatment two specimens, neither of which was designated as the type. One of those specimens is the same one cited earlier by Sasaki, and it is here designated as the holotype of *Z. koshunense.* Moo remains the author of the name because he, rather than the present authors, provided the validating description (Art. 46.2). The holotype, at TAIF, was collected in 1910 from Abei (Apei) in Taidong (Taitung) County in southern Taiwan, according to Moo, although the collection date given on the label is actually 2 January 1911 (Wen-Liang Chiou, pers. comm.). The other specimen was collected by Moo himself on Lan Yu (Orchid Island), off the eastern coast of southern Taiwan, in September 1972, and is preserved at TAI (3 sheets; Chang-Fu Hsieh, pers. comm.). In addition, a third collection of *Z. koshunense* was made by Shu-Miaw Chaw in Pingdong (Pingtung) County in southern Taiwan in October 1988 (HAST, NMNS, MO, PE, TAIF, TNU).

Zingiber koshunense C. T. Moo, sp. nov. TYPE: China. Taiwan: Taidong [Taitung] County, Abei [Apei], 2 Jan. 1911 (fl), *T. Kawakami & S. Sasaki s.n.* (holotype, TAIF).

Zingiber koshunense Hayata ex C. T. Moo, in H. L. Li et al., Fl. Taiwan 5: 850. 1978, nom. inval. (Arts. 8.1, 37.1). TYPE: not indicated.

Acknowledgments. We thank Wen-Liang Chiou,

of the Division of Forest Biology at the Taiwan Forestry Research Institute, for supplying digital images and other details of specimens of *Zingiber koshunense* at TAIF. We also thank Chang-Fu Hsieh, of the Department of Botany at the National Taiwan University, for providing information on Moo's collection of *Z. koshunense* at TAI.

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Four New Names in Chinese and Vietnamese Zingiberaceae

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ABSTRACT. During preparation of the account of Zingiberaceae for the *Flora of China*, volume 24, it was noticed that four species are illegitimately named, being later homonyms: *Amomum thyrsoideum* Gagnepain (1903), not Ruiz and Pavón (1798), *A. aurantiacum* H. T. Tsai & S. W. Zhao (1979), not Ridley (1920), *Hedychium carneum* Y. Y. Qian (1994), not Loddiges (1823), and *Zingiber truncatum* S. Q. Tong (1987), not Stokes (1812). Therefore, the following new names (nomina nova) are proposed here, respectively: *A. gagnepainii* T. L. Wu, K. Larsen & Turland, *A. neoaurantiacum* T. L. Wu, K. Larsen & Turland, *H. neocarneum* T. L. Wu, K. Larsen & Turland, and *Z. neotruncatum* T. L. Wu, K. Larsen & Turland.

Amomum gagnepainii T. L. Wu, K. Larsen & Turland, nom. nov. Replaced name: *Amomum thyrsoideum* Gagnepain, Bull. Soc. Bot. France 49: 256. 1903. Not Ruiz & Pavón, Fl. Peruv. 1: 2. 1798. TYPE: Vietnam. "In montibus Lat són [Lang Son], loco dicto Quen-Se, 11 juin 1884," *R. P. Bon, plantes du Tonkin occidental, 2687* (holotype, P).

Amomum thyrsoideum Gagnepain (1903) was described from northeastern Vietnam, close to the border with Guangxi Zhuang Autonomous Region, China. Unfortunately, the name is illegitimate under Article 53.1 of the *Tokyo Code* (Greuter et al., 1994) because an earlier homonym exists: *A. thyrsoideum* Ruiz & Pavón (1798), described from Peru (now *Renealmia thyrsoidea* (Ruiz & Pavón) Poeppig & Endlicher). The Asian species will be accepted by Wu and Larsen (in press) in their forthcoming account of Zingiberaceae in the *Flora of China*, volume 24, as occurring not only in Vietnam, but also in adjacent southwestern Guangxi, agreeing with previous records from Longjin (Longzhou) and Ningming by Tsai et al. (1981: 134) in their account of Chinese *Amomum*. Therefore, a new name (nomen novum) for *A. thyrsoideum* is required, and *A. gagnepainii* T. L. Wu, K. Larsen & Turland is proposed here. *Amomum gagnepainii* is most similar to *A. yunnanense* S. Q. Tong (1990: 151), described from Yingjiang in western Yunnan province. *Amomum gagnepainii* differs from *A. yunnanense* in having flowers yellow (vs. white), with calyx to only 1 cm (vs. 1.5–2 cm), labellum spatulate-flabellate (vs. oblate), and lateral staminodes dentate, ca. 1 mm (vs. lateral staminodes absent).

Amomum neoaurantiacum T. L. Wu, K. Larsen & Turland, nom. nov. Replaced name: *Amomum aurantiacum* H. T. Tsai & S. W. Zhao, in H. T. Tsai & P. S. Chen, Acta Phytotax. Sin. 17(4): 91. 1979. Not Ridley, J. Fed. Malay States Mus. 10: 153. 1920. TYPE: China. Yunnan: Mengla, 600 m, *S. W. Zhao 8096* (holotype, HITBC).

Amomum aurantiacum H. T. Tsai & S. W. Zhao (in Tsai & Chen, 1979) was described from Mengla in southernmost Yunnan. The name is illegitimate, as it is a later homonym of *A. aurantiacum* Ridley (1920), described from Kota Baharu, northern Kelantan, Peninsular Malaysia. The Chinese species will be accepted by Wu and Larsen (in press); therefore, the new name *A. neoaurantiacum* T. L. Wu, K. Larsen & Turland is proposed here. *Amomum neoaurantiacum* is most similar to *A. microcarpum* C. F. Liang & D. Fang (in D. Fang, 1978: 49), described from Dongxing in southern Guangxi, very near the coast and the border with Vietnam. *Amomum neoaurantiacum* differs from *A. microcarpum* in having ligules 6–7 mm, 2-cleft at apex (vs.

4–10 mm, rounded and entire or rarely emarginate at apex), bracts purple, oblong, ca. 1.2 cm (vs. brown, lanceolate to ovate, ca. 3 cm), and lateral staminodes ca. 1 cm, emarginate at apex (vs. 5–6 mm, entire at apex).

Hedychium neocarneum T. L. Wu, K. Larsen & Turland, nom. nov. Replaced name: *Hedychium carneum* Y. Y. Qian, Acta Bot. Austro Sin. 9: 48. 1994. Not Loddiges, Bot. Cab. 7: t. 693. 1823. TYPE: China. Yunnan: Simao, 1600–1900 m, *Y. Y. Qian 1832* (holotype, SMAO).

Hedychium carneum Y. Y. Qian (1994) was described from Simao in southern Yunnan. The name is illegitimate, as it is a later homonym of *H. carneum* Loddiges (1823), described from material cultivated in England that had been introduced from India. The Chinese species will be accepted by Wu and Larsen (in press); therefore, the new name *H. neocarneum* T. L. Wu, K. Larsen & Turland is proposed here. *Hedychium neocarneum* is most similar to *H. yungjiangense* S. Q. Tong (1986: 40), described from Yingjiang in western Yunnan. *Hedychium neocarneum* differs from *H. yungjiangense* in having leaves villous abaxially (vs. brownish pubescent only along midvein abaxially), the labellum white, becoming red basally (vs. wholly white), and the filament 5.2–5.7 cm (vs. ca. 1.3 cm).

Zingiber neotruncatum T. L. Wu, K. Larsen & Turland, nom. nov. Replaced name: *Zingiber truncatum* S. Q. Tong, Acta Phytotax. Sin. 25: 147. 1987. Not Stokes, Bot. Mat. Med. 1: 68. 1812. TYPE: China. Yunnan: Jinghong, 810 m, 12 Aug. 1984, *S. Q. Tong & S. Liu 24935* (holotype, YNTBI).

Zingiber truncatum S. Q. Tong (1987) was described from Jinghong in southern Yunnan. The name is illegitimate, as it is a later homonym of *Z. truncatum* Stokes (1812), which is itself illegitimate, as a nomenclaturally superfluous synonym of *Amomum zedoaria* Christmann 1797 (now *Curcuma zedoaria* (Christmann) Roscoe). Tong's species will be accepted by Wu and Larsen (in press); therefore, the new name *Z. neotruncatum* T. L. Wu, K. Larsen & Turland is proposed here. *Zingiber neotruncatum* is most similar to *Z. zerumbet* (L.) Roscoe ex Smith, distributed in Cambodia, China, India, Laos, Malaysia, Sri Lanka, Thailand, and Vietnam (and also widely cultivated). *Zingiber neotruncatum* differs from *Z. zerumbet* in having ligules 1–1.2 cm (vs. 1.5–2 cm), the central lobe of the labellum ligule-like (vs. suborbicular or subobovate), and lateral lobes of the labellum inconspicuous, ca. 3 mm (vs. obovate, ca. 1 cm, free almost to base).

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A New Name in East Asian Eriocaulaceae

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ABSTRACT. During preparation of the account of Eriocaulaceae for the *Flora of China*, volume 24, it was noticed that one species, *Eriocaulon bilobatum* W. L. Ma, described from China in 1991, is illegitimately named, being a later homonym of *E. bilobatum* Morong, which was described from Mexico in 1892. The new name (nomen novum) *E. kunmingense* Z. X. Zhang was proposed in 1999, but the pagination of the entire paper in which the replaced name was published was cited, rather than the pages of the protologue only, so the new name is invalid. Therefore, *E. kunmingense* is validated here.

Eriocaulon kunmingense Z. X. Zhang, nom. nov.

Replaced name: *Eriocaulon bilobatum* W. L. Ma, Acta Phytotax. Sin. 29: 301. 1991. Not Morong, Bull. Torrey Bot. Club 19: 226. 1892. TYPE: China. Yunnan: Binchuan, Jizushan, 24 Dec. 1946, *T. N. Liou 22187* (holotype, PE).

Eriocaulon bilobatum W. L. Ma (1991: 301) was described from China, with the holotype specimen cited from Binchuan, in Yunnan province, and paratypes cited from Guizhou, Sichuan, and Yunnan provinces. Unfortunately, the name is illegitimate under Article 53.1 of the *Tokyo Code* (Greuter et al., 1994) because an earlier homonym exists: *E. bilobatum* Morong (1892), described from Mexico. The Chinese species will be accepted by Ma et al. in their forthcoming account of Eriocaulaceae in the *Flora of China*, volume 24 (in press), as occurring not only in Guizhou, Sichuan, and Yunnan provinces of China but also India and Vietnam. Zhang (1999: 91) also accepted the species and proposed the new name, *E. kunmingense* Z. X. Zhang, but the reference given for the replaced name was "*E. bilotatum* [sic] W. L. Ma 1991: 289–314," i.e., the entire paper in which *E. bilobatum* was published, rather than page or pages of the protologue itself (pp. 301–303), so the new name was invalid under Article 33.2, Note 1 of the *Tokyo Code*. Moreover, the reference is not direct, as required by Article 33.2. Therefore, *E. kunmingense* is validated here. *Eriocaulon kunmingense* is most similar to *E. leianthum* W. L. Ma (1991: 303), which was described from northwestern Yunnan. *Eriocaulon kunmingense* differs from *E. leianthum* in having female flowers with sepals keeled (vs. not keeled) and petals glabrous (vs. adaxially villous at center) with an emarginate (vs. acute) apex.

Acknowledgments. I thank Bruce Bartholomew (Botany Department, California Academy of Sciences) and Nicholas Turland (Missouri Botanical Garden) for extensive help in preparing the text.

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Addendum

Baldwin, B. G. 1999. New combinations and new genera in the North American tarweeds (Compositae—Madiinae). Novon 9: 462–471.

In the key to genera of Madiinae, the sole, endemic Mexican genus, *Adenothamnus*, was omitted. The following changes to the key incorporate *Adenothamnus.*

Change 9b to:

9b. Plants herbaceous **or woody with seasonal foliage;** North American or South American.

Between 13b and 14, insert the following couplet:

13a′. Plants shrubby; Mexican . . . *Adenothamnus* D. D. Keck

13b′. Plants herbaceous; Californian (to northwestern U.S.A. and southwestern Canada).

Volume 10, Number 1, pp. 1–94 of NOVON was published on 17 April 2000.

Volume 10
Number 2
2000

NOVON

The Status of *Dimorphostemon* and Two New Combinations in *Dontostemon* (Brassicaceae)

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ABSTRACT. *Dimorphostemon* is reduced to synonymy of *Dontostemon*, and the combined genus consists of 10 species distributed primarily in China, adjacent Russia, and Mongolia. The new combinations *Dontostemon pinnatifidus* and *D. pinnatifidus* subsp. *linearifolius* are proposed, and detailed descriptions and distributions of the two taxa are given. A key to all species of *Dontostemon* is presented.

The genus *Dontostemon* Andrzejowski ex C. A. Meyer consists of 10 species distributed primarily in China (all 10 spp.), neighboring Russia (9 spp.), and Mongolia (7 spp.). The range of *D. glandulosus* (Karelin & Kirilov) O. E. Schulz extends into India, Kashmir, Kazakstan, Nepal, and Tajikistan, and that of *D. dentatus* (Bunge) Ledebour includes Korea and Japan.

The taxonomic limits of *Dontostemon* have been controversial mainly because various authors placed different emphasis on one character, the union vs. separation of median stamens. In eight species, the median stamens are united, but the degree of union varies from half to full length of the filaments. These species are kept in *Dontostemon* by all treatments. In two species, *D. pinnatifidus* (Willdenow) Al-Shehbaz & H. Ohba and *D. glandulosus*, the median stamens are free, and these have been segregated into *Dimorphostemon* Kitagawa and *Alaida* Dvořák. There are no other morphological characters that separate the eight species with united staminal filaments from the two species with free filaments.

In our opinion, *Dontostemon* (including *Dimorphostemon* and *Alaida*) is a natural genus, and there are several genera of the Brassicaceae (e.g., North American *Streptanthus* Nuttall and *Caulanthus* S. Watson) that have species with free or connate median stamens. In *Thelypodium howellii* S. Watson (western North America), one subspecies has the median stamens free and the other has them partly to completely united (Al-Shehbaz, 1973). In our opinion, the union of the median stamens alone does not justify the splitting of a natural genus into poorly defined segregates.

Although *Dontostemon pinnatifidus* is known under different specific epithets in *Dontostemon* or *Dimorphostemon*, none of these epithets has priority. The species was first described as *Sisymbrium asperum* Pallas (Reise Russ. Reich. 3: 740. 1777), which is a later homonym of *S. asperum* L. (Sp. Pl. 2: 659. 1753). In transferring *S. asperum* Pallas as the sole species of *Dimorphostemon*, Kitagawa (1939) correctly considered *Cheiranthus* (as *Cheilanthus*) *pinnatifidus* Willdenow (Sp. Pl. 3(1): 523. 1800), *Hesperis pinnata* Persoon (Syn. Pl. 2: 203. 1807), *Hesperis pilosa* Poiret and *H. punctata* Poiret (Encycl. Méth. Suppl. 3: 157, 195. 1813), and *Sisymbrium pectinatum* DC. (Syst. Nat. 2: 485. 1824) as conspecific with his *Dimorphostemon asper* Ki-

tagawa (not *D. asper* (Pallas) Kitagawa, as listed by Kitagawa; see article 58.3 in Greuter et al., 1994). Forty years later, Kitagawa (1979) proposed a new combination, *Dimorphostemon pinnatus* (Persoon) Kitagawa, based on the second earliest available epithet, *H. pinnata*, and did not list *Cheiranthus pinnatifidus* in the synonymy. Earlier, Golubkova (1974a, b) proposed the combination *Dimorphostemon pectinatus* (DC.) Golubkova, thus adopting the fifth oldest epithet for the species. Strangely, Golubkova (1976) maintained *D. pectinatus* and followed de Candolle (1824) and Kitagawa (1939) in reducing the earlier published epithets to synonymy. Willdenow's epithet (*pinnatifidus*) clearly is the earliest (1800) available name for the species, and a new combination is herein proposed.

Dvořák (1972) proposed the new genus *Alaida*, but this name is illegitimate because it included *A. pectinata* (DC.) Dvořák, which is a synonym of the type of *Dimorphostemon*, *Dimorphostemon asper* (= *Dontostemon pinnatifidus*). A key for the determination of the 10 species of *Dontostemon* is presented.

KEY TO THE SPECIES OF *DONTOSTEMON*

1a. Plants glandular.
- 2a. Petals (10–)12–18 × (4–)6–8 mm; fruits flattened; anthers not apiculate, 1.5–2 mm long . . . . . *D. hispidus* Maximowicz
- 2b. Petals 2–8 × 0.5–3(–5) mm; fruits terete; anthers apiculate, 0.2–0.8 mm long.
  - 3a. All leaves entire; median stamens united; stems with minute twisted trichomes . . . . . *D. integrifolius* (L.) C. A. Meyer
  - 3b. At least basal leaves dentate, serrate, or pinnatifid; median stamens free; stems glabrous or with straight trichomes.
    - 4a. Petals obovate, (5–)6–8 mm long; filaments of median stamens abruptly expanded and toothed below anther; seeds apically margined; anthers 0.6–0.8 mm long . . . . . *D. pinnatifidus* (Willdenow) Al-Shehbaz & H. Ohba
    - 4b. Petals spatulate, 2–4(–4.5) mm long; filaments of median stamens gradually expanded to base, toothless; seeds not margined; anthers 0.2–0.4 mm long . . . . . *D. glandulosus* (Karelin & Kirilov) O. E. Schulz

1b. Plants not glandular.
- 5a. At least some stem leaves petiolate, dentate . . . . . *D. dentatus* (Bunge) Ledebour
- 5b. Stem leaves sessile, entire.
  - 6a. Plants annual or biennial, never woody basally; stems with minute twisted trichomes.
    - 7a. Petals broadly obovate, 5–7(–8) × 2–3 mm, apex subemarginate; anthers oblong, 0.7–0.8 mm; ovules 15 to 25 per locule . . . . . *D. integrifolius* (L.) C. A. Meyer
    - 7b. Petals narrowly oblanceolate, 3–5 × 0.6–1 mm, apex obtuse; anthers ovate, 0.4–0.5 mm; ovules 30 to 50 per locule *D. micranthus* C. A. Meyer
  - 6b. Plants perennial with woody base; stems glabrous or with straight trichomes.
    - 8a. Stems glabrous; leaves somewhat fleshy, subleathery; fruit strongly arcuate or twisted.
      - 9a. Fruit terete, strongly arcuate, 1.5–2.5 cm × 1–1.7 mm; style 1.5–2.5 mm long; plants 5–10 cm tall; sepals 3–4 mm long; median stamens 3.5–4 mm long . . . . . *D. crassifolius* (Bunge) Maximowicz
      - 9b. Fruit compressed, strongly twisted, 3–5 cm × 2–2.5 mm; style rarely to 0.5 mm long; plants 15–50 cm tall; sepals 5–6 mm long; median stamens 6–8 mm long . . . . . *D. elegans* Maximowicz
    - 8b. Stems sparsely to densely pilose; leaves not fleshy, herbaceous; fruit straight or rarely slightly curved.
      - 10a. Plants pilose with subappressed trichomes rarely to 1 mm long; fruit 1–2.5 cm × 0.9–1.1 mm; seeds to 1.4 mm long, not margined; cotyledons incumbent . . . *D. perennis* C. A. Meyer
      - 10b. Plants hirsute with spreading trichomes to 3 mm long; fruit (2.5–)3–5 cm × 1.4–2 mm; seeds to 2.5 mm long, margined or winged; cotyledons accumbent . . . . *D. senilis* Maximowicz

Dontostemon pinnatifidus (Willdenow) Al-Shehbaz & H. Ohba, comb. nov. Basionym: *Cheiranthus pinnatifidus* Willdenow, Sp. Pl. 3(1): 523. 1800. TYPE: Siberia, *Stephan s.n.* (holotype, B-W #12111).

Herbs annual or biennial, (5–)10–40(–60) cm tall, sparsely to densely glandular. Stems erect, often simple, branched above. Basal and lowermost stem leaves sparsely to densely pubescent with simple tri-

chomes to 2 mm long, sparsely to moderately glandular; petiole 2–10(–15) mm long; leaf blade lanceolate to elliptic or oblong, (0.7–)1.5–4.5(–6) cm × (1.5–)3–10(–15) mm, base attenuate to cuneate, margin coarsely dentate or serrate to pinnatifid, ciliate, apex acute. Middle and upper stem leaves narrowly linear and entire, or elliptic to lanceolate and dentate to serrate. Fruiting pedicel ascending to divaricate, often straight, (0.3–)0.5–1.5(–2.3) cm long, glandular. Sepals oblong, 2–3(–4) × (0.8–)1–1.5 mm, apically sparsely hairy or glabrous. Petals white, broadly obovate, (5–)6–8 × (2.5–)3–4(–5) mm, apex emarginate; claw 1–3 mm long. Filaments of median stamens 2–3 mm long, free, abruptly expanded and toothed below anther; filament of lateral stamens 1.5–2.5 mm long, slender; anthers oblong-ovate, 0.6–0.8 mm long, apiculate. Ovules 8 to 30 per locule. Fruit (1.1–)1.5–4(–5) × (0.8–)1–1.3 mm, straight, erect to ascending, torulose, terete; valves sparsely to densely glandular, with prominent midvein and marginal veins; style 0.5–1.5 mm long; stigma slightly lobed. Seeds brown, oblong-ovate to narrowly oblong, 1.1–2.3 × 0.7–1 mm, narrowly margined distally; cotyledons obliquely accumbent to incumbent. Flowering and fruiting June–September.

Dontostemon pinnatifidus can be divided into two morphologically well-defined subspecies that have not yet been collected from the same locality, though both grow in the Chinese provinces of Gansu, Qinghai, and Xinjiang.

KEY TO THE SUBSPECIES OF *DONTOSTEMON PINNATIFIDUS*

1a. Plants pilose, moderately to densely glandular, middle stem leaves elliptic to lanceolate, serrate to dentate or rarely pinnatifid, (3–)5–10(–15) mm wide; seeds oblong to ovate, 1.1–1.8 mm long; cotyledons obliquely accumbent to obliquely incumbent . . . . . subsp. *pinnatifidus*

1b. Plants glabrous, very sparsely glandular, middle stem leaves narrowly linear, entire, 0.5–1(–1.5) mm wide; seeds narrowly oblong, 2–2.3 mm long; cotyledons incumbent . . . subsp. *linearifolius*

Dontostemon pinnatifidus subsp. **pinnatifidus**

Dimorphostemon shanxiensis R. L. Guo & T. Y. Cheo, Bull. Bot. Lab. North-East. Forest. Inst., Harbin 1980(6): 29. 1980. Syn. nov. TYPE: China. Shanxi: Wutai Shan, 16 July 1907, *Y. Yabe s.n.* (holotype, NAS).

Erysimum glandulosum Monnet, Notul. Syst. (Paris) 11: 241. 1912. Syn. nov. TYPE: China. E Tibet: Tongolo, Kiala, 10 June 1894, *J.-A. Soulié 2471* (holotype, P).

Erysimum hookeri Monnet, Notul. Syst. (Paris) 11: 242. 1912. Syn. nov. TYPE: China. E Tibet: Tongolo, Kiala, 13 Apr. 1894, *J.-A. Soulié 2460* (holotype, P; isotype, P).

Plants sparsely to densely pilose, moderately to densely glandular. Middle stem leaves elliptic to lanceolate, serrate to dentate or rarely pinnatifid, (3–)5–10(–15) mm wide. Seeds oblong to ovate, 1.1–1.8 mm long; cotyledons obliquely accumbent to obliquely incumbent.

Grassy plains, hillsides, rocky slopes, roadsides; 1100–4600 m. China (Gansu, Hebei, Heilongiang, Nei Mongol, Qinghai, Shandong, Sichuan, Xinjiang, Xizang, Yunnan), India, Mongolia, Nepal, Russia.

Because subspecies *pinnatifidus* is very widespread and well represented in herbaria, no specimens are cited here. The types of *Dimorphostemon shanxiensis*, *Erysimum glandulosum*, and *E. hookeri* are morphologically indistinguishable from plants of *D. pinnatifidus* and, therefore, herein reduced to synonymy.

Dontostemon pinnatifidus subsp. **linearifolius** (Maximowicz) Al-Shehbaz & H. Ohba, stat. et comb. nov. Basionym: *Sisymbrium glandulosum* (Karelin & Kirilov) Maximowicz var. *linearifolium* Maximowicz, Fl. Tangutica 61. 1889. TYPE: China. [Qinghai:] sandy shores of Lake Kukunor, 10,200 ft., 9 July 1880, *N. M. Przewalski s.n.* (holotype, LE; isotypes, LE, P).

Plants glabrous, very sparsely glandular. Middle stem leaves narrowly linear, entire, 0.5–1(–1.5) mm wide. Seeds narrowly oblong, 2–2.3 mm long; cotyledons incumbent. Flowering and fruiting July–August.

Sand dunes, flood plains, grasslands; 3100–4500 m. Endemic to China (Gansu, Qinghai, Xinjiang).

Specimens examined. CHINA. **Qinghai:** between Madoi and Bayanka La, 34°44′N, 98°7′E, *Meihe, Liu & Sonamco 98–35605* (GOET, MO); Sari (Darlag) Xian, Huleanma, Jianshe Xiang, S side of Huang He and SW of confluence with Dari He (Dar Qu), 33°43′40″N, 99°21′1″E, *Ho, Bartholomew & Gilbert 1154* (BM, CAS, HNWP, MO); Maqin Xian, Naheqingma, Youyun Xian, between Dari and Huashixia, 33°18′39″N, 99°10′53″E, *Ho, Bartholomew & Gilbert 1329* (BM, CAS, HNWP, MO). **Xinjiang:** Ruoqiang, Yueya river to Aqqikkol, *Wu, Ohba, Wu & Fei 2278* (TI); Ruoqiang, Bing He, *Wu, Ohba, Wu & Fei 4212* (KUN, TI).

A rather rare taxon known to us only from the specimens cited above.

Acknowledgments. We are grateful to Brigitte Zimmer and Manfred Bässler (B) for their help in providing information on the type of *Cheiranthus pinnatifidus* in the Willdenow herbarium. We thank Tatyana Shulkina (MO) for her help in translating various Russian literature, and Neil A. Harriman for his critical review of the manuscript.

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The Status of *Synstemon* (Brassicaceae) and the Discovery of a Second Species

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ABSTRACT. The taxonomic limits of *Synstemon* are established, and its relationship to *Dontostemon* is discussed. *Synstemon lulianlianus*, a new species from Gansu, is described and illustrated. Previously described taxa in *Synstemon* are reduced to synonymy of *S. petrovii*.

The genus *Synstemon* was established by Botschantsev (1959) to include one species and two varieties. It was compared with *Cymatocarpus* O. E. Schulz and *Arabidopsis* Heynhold and was said to differ from these in having ciliate petal claws, connate and pubescent median filaments, and margined seeds. *Synstemon* is unrelated to *Cymatocarpus* or *Arabidopsis*, and it also differs from both by having flattened and strongly crisped instead of the rigid and straight trichomes, strongly differentiated instead of undifferentiated petal claws, and apiculate instead of obtuse anthers. *Cymatocarpus* also has yellow flowers, long setose trichomes, and submoniliform fruits, whereas *Synstemon* has lavender flowers, soft trichomes, and torulose fruits. In our opinion, *Synstemon* is unrelated to these genera.

Botschantsev (1959) distinguished *Synstemon* from *Dontostemon* Andrzejowski ex C. A. Meyer because of the former's ciliate petal claws, veinless septa, and mucilaginous seeds, but a closer examination reveals that the difference in the fruit septum (veined vs. veinless) is unreliable, and most of the 10 species of *Dontostemon* have veinless septa. *Synstemon* differs in having pilose petal claws, entire stigmas, mucilaginous seeds, median stamens united only at the very base, terete replum, median nectaries present and confluent with the laterals, and flattened, strongly crisped trichomes, as well as in lacking the multicellular glands seen in some species of *Dontostemon*. By contrast, *Dontostemon* has glabrous filaments and petal claws, 2-lobed stigmas, nonmucilaginous seeds, median filaments united near to the apex, flattened replum, no median nectaries, straight or slightly twisted terete trichomes, and (in four species) well-developed multicellular glands. The two genera share many characters, and it appears that *Synstemon* is more closely related to *Dontostemon* than to any other Asian genus of Brassicaceae (Cruciferae).

Because of fear that *Synstemon* might be considered a later homonym of *Synostemon* F. Müller, which is a synonym of *Sauropus* Blume of the Euphorbiaceae, Botschantsev (1980) proposed *Synstemonanthus* as a replacement of *Synstemon*. However, the pronunciations of the two are quite different, and we agree with Brummitt (1992) in recognizing *Synstemon* instead of *Synstemonanthus*.

The presence in *Synstemon* of pilose petal claws and filaments is unique among all of the Old World Brassicaceae. This feature clearly supports the maintenance of the genus as independent of *Dontostemon*, as well as those Eurasian genera with connate median filaments. Pubescent petal claws and/or filaments are known among several genera in the New World, including the North American *Stanleya* Nuttall, *Warea* Nuttall, *Rollinsia* Al-Shehbaz, and a species of *Dryopetalon* A. Gray (Al-Shehbaz, 1982, 1985; Payson, 1923; Rollins, 1939, 1993), as well as the South American *Chilocardamum* O. E. Schulz, *Pterygiosperma* O. E. Schulz, *Sarcodraba* Gilg & Muschler, *Sisymbrium subscandens* Spegazzini, and *Trichotolinum* O. E. Schulz (Boelcke & Romanczuk, 1984; Schulz, 1924, 1936).

Synstemon remained monotypic until An (1981) added *S. linearifolius* An (as *linearifolia*) and *S. petrovii* var. *xinglongnicus* An (as *xinglongnica*). These two new taxa, along with Botschantsev's

(1959) *S. petrovii* and *S. petrovii* var. *pilosus*, were recognized by An (1987) and Zhao (1998a). Because *S. linearifolius* has glabrous filaments and petal claws and because its median stamens are connate to the apex, the species is clearly a *Dontostemon*, and we agree with Zhao (1998b) in reducing *S. linearifolia* to synonymy of *D. integrifolius* (L.) C. A. Meyer. Finally, Zhao (1998c) described *S. deserticola* Y. Z. Zhao from Nei Mongol, but we believe that this is only a minor variant of *S. petrovii* and, as it stands now, *Synstemon* remained monotypic until the present publication.

The discovery of a second species of *Synstemon* was made during a visit by Al-Shehbaz to the Komarov Botanical Institute in 1998. It prompted a closer study of the genus for the forthcoming account of the Brassicaceae for the *Flora of China*.

Synstemon Botschantsev, Bot. Zhurn. (Moscow & Leningrad) 44: 1487. 1959. *Synstemonanthus* Botschantsev, Novosti Sist. Vyssh. Rast. 17: 142. 1980. TYPE: *Synstemon petrovii* Botschantsev.

Herbs annual or biennial. Trichomes flattened, strongly crisped, simple or minutely stalked and forked. Stems erect to ascending, often branched basally. Basal leaves petiolate, rosulate or not, simple, pinnatipartite to pinnatisect, often withered by flowering. Cauline leaves petiolate or sessile, not auriculate, entire to pinnatisect. Racemes ebracteate, elongated in fruit. Fruiting pedicels ascending to divaricate. Sepals oblong, ascending, base of inner pair not saccate. Petals lavender, much longer than sepals; blade obovate, apex rounded; claw subequaling sepals, sparsely to densely pubescent. Stamens 6, tetradynamous; filaments glabrous or sparsely to densely pubescent on proximal half, slightly dilated at base, median pairs united only basally; anthers oblong, apiculate at apex. Nectar glands confluent and subtending bases of all stamens; median nectaries present. Ovules 10–16 per ovary. Fruit dehiscent siliques, linear, latiseptate, sessile or short stipitate; valves papery, with a distinct midvein, sparsely pubescent basally when young, torulose; replum rounded; septum complete, membranous, translucent, veinless; style to 1 mm; stigma capitate, entire. Seeds uniseriate, winged distally, oblong, somewhat plump; seed coat minutely reticulate, mucilaginous when wetted; cotyledons incumbent.

Two species: endemic to China (Gansu Province and Nei Mongol Autonomous Region).

KEY TO THE SPECIES OF *SYNSTEMON*

1a. Annuals; stem leaves linear, sessile, entire, 0.5–1.7 mm wide; fruit straight; filaments sparsely to densely pilose . . . . . 1. *S. petrovii*
1b. Biennials; stem leaves narrowly lanceolate, petiolate, pinnatifid to pinnatisect, 5–10 mm wide; fruit arcuate; filaments glabrous 2. *S. lulianlianus*

1. Synstemon petrovii Botschantsev, Bot. Zhurn. (Moscow & Leningrad) 44: 1487. 1959. *Synstemonanthus petrovii* (Botschantsev) Botschantsev, Novosti Sist. Vyssh. Rast. 17: 142. 1980. TYPE: China. Gansu: Injtshuanj, Hoangho, near Injtshuanj, 18 June 1958, *M. Petrov s.n.* (holotype, LE).

Synstemon petrovii var. *pilosus* Botschantsev, Bot. Zhurn. (Moscow & Leningrad) 44: 1488. 1959. *Synstemonanthus petrovii* (Botschantsev) Botschantsev var. *pilosus* (Botschantsev) Botschantsev, Novosti Sist. Vyssh. Rast. 17: 142. 1980. Syn. nov. TYPE: China. Gansu: Tshizhanji, Beida Shan, near Junt Shan, 28 June 1958, *M. Petrov s.n.* (holotype, LE).

Synstemon petrovii var. *xinglongnicus* An, Bull. Bot. Res., Harbin 1(1 & 2): 101. 1981. Syn. nov. TYPE: China. Gansu: Xinglong Shan, *Anonymous s.n.* (holotype, NWTC).

Synstemon deserticola Y. Z. Zhao, Acta Phytotax. Sin. 36: 373. 1998. Syn. nov. TYPE: China. Nei Mongol: Alxa Right Banner, Ailibugaisumu, Longshoushan, 8 June 1983, *X. T. Lei et al. 83002* (holotype, HIMU).

Herbs annual, 15–30 cm tall. Stems often branched basally and above, sparsely pilose or glabrescent. Basal leaves short petiolate, not rosulate, often withered by flowering, pinnatipartite, 1–2 cm × 3–5 mm, apex acute. Stem leaves linear, sessile, 0.5–4 cm × 0.5–1.7 mm, somewhat fleshy, margin entire, apex acute, sparsely pilose. Fruiting pedicels divaricate to ascending, slender, glabrous, 4–10 mm long. Sepals oblong, 2–2.5 × 0.9–1.2 mm, glabrous to densely pilose. Petals lilac, obovate, 4–5.5 × 1.7–2.8 mm, apex rounded; claw 1–2.5 mm long, sparsely to densely pilose. Filaments of median stamens 2–3.5 mm long, united at base, sparsely to densely pilose on basal half; lateral stamens 1–2 mm long, pilose basally; anthers oblong, 0.6–0.8 mm long. Ovules 10 to 12 per locule. Fruit linear, compressed, (0.5–)1.3–3 cm × 0.8–1.5 mm, straight; valves sparsely pubescent basally when young, soon glabrescent, with a distinct midvein; gynophore ca. 0.5 mm long; style 0.5–1 mm long. Seeds oblong, 1.2–1.7 × 0.7–0.9 mm. Flowering and fruiting in June.

Synstemon petrovii grows on slopes and rocky and sandy flats at 1500–2400 m. It is restricted to Gansu and neighboring Nei Mongol and is known

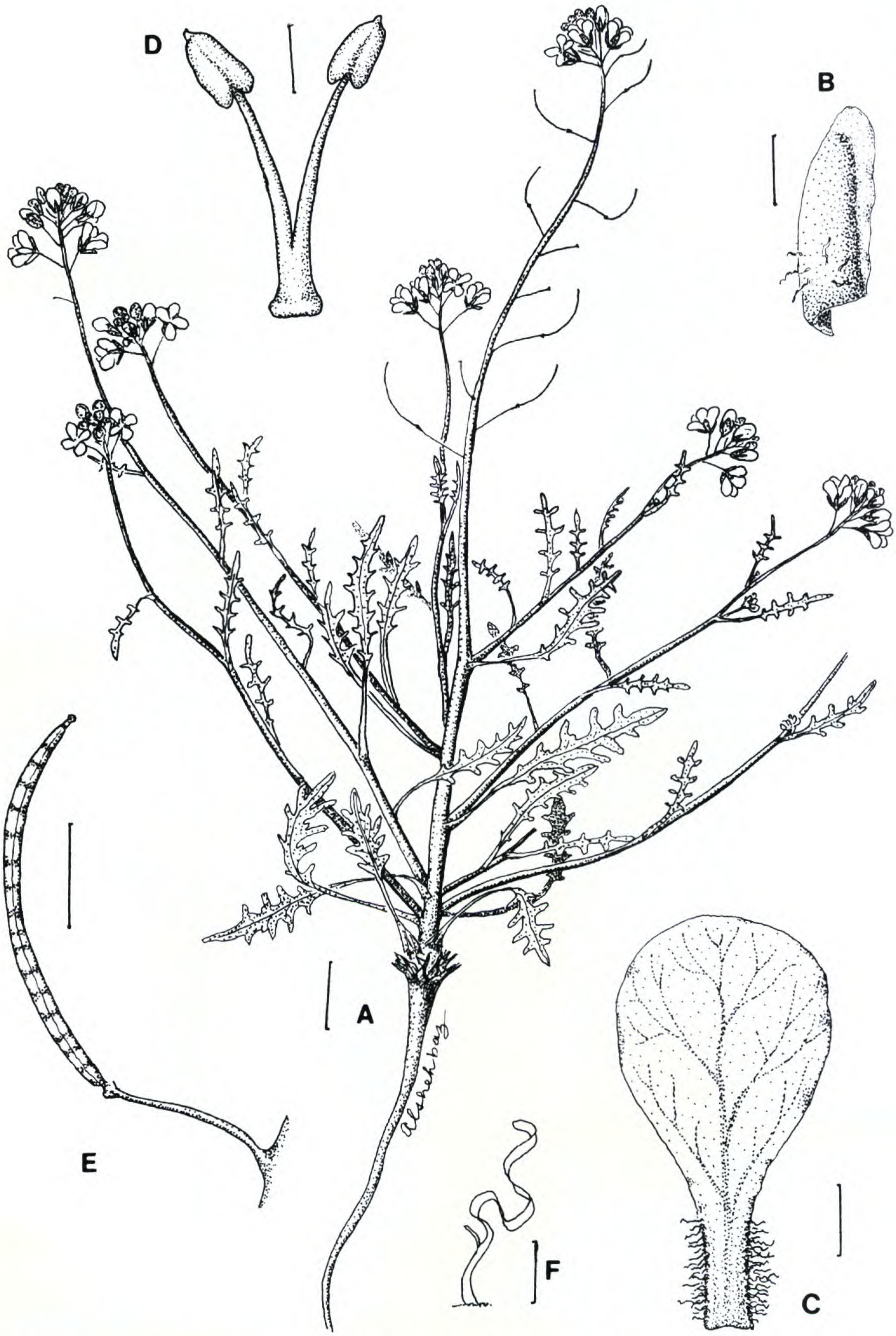

Figure 1. *Synstemon lulianlianus* Al-Shehbaz, T. Y. Cheo & G. Yang. —A. Plant. —B. Sepal. —C. Petal. —D. Median stamens. —E. Fruit and fruiting pedicel. —F. Trichome. Scale: A = 1 cm; B–D = 1 mm; E = 5 mm; F = 0.1 mm. Drawn by Al-Shehbaz from the holotype.

thus far only from the types and the additional collection cited below.

Although we have not examined the type of *Synstemon deserticola*, the detailed description and illustration leave no doubt that it is a synonym of *S. petrovii*. The trichome density on leaves, stems, and sepals of *S. petrovii* exhibits continuous variation and, therefore, variety *pilosus* (with densely pubescent sepals) and variety *xinglongnicus* (with glabrous leaves and stems) do not merit recognition. The type of *S. petrovii* has glabrous sepals, but the additional collection cited above has sparsely pubescent sepals and leaves. *Synstemon petrovii* also varies in the density of trichomes on the filaments. A closer examination of the type shows, contrary to the original illustration, that the median filaments are very sparsely pilose instead of being glabrous at the base.

Additional collection. CHINA. **Gansu:** 60 km N of Unchang, E of Begashan, 29 June 1958, *Petrov s.n.* (LE).

The illustration of *Synstemon petrovii* in Ying et al. (1993) belongs to some other species, and we have not seen the specimen on which that illustration was based. Neither the petals nor the stamens were illustrated, and if the voucher of that illustration is indeed a *Synstemon*, then it must be *S. lulianlianus* because of its pinnatisect cauline leaves and curved fruits. It is possible, however, that a species of *Dontostemon* was instead illustrated because *S. lulianlianus* is a biennial with petiolar remains of the preceding year, and the illustration in Ying et al. (1993) clearly represents an annual plant.

2. Synstemon lulianlianus Al-Shehbaz, T. Y. Cheo & G. Yang, sp. nov. TYPE: China. N Gansu: Tam-zhi, near railroad station, 22 Apr. 1909, *F. Dushendenko 156* (holotype, LE). Figure 1.

Herba biennis, 7–15 cm alta, pilis crispatis; folia basalia et caulina inferiora petiolata, pinnatisecta vel pinnatifida, 1–2.5 cm × 4–10 mm; folia caulina anguste lanceolata, pinnatisecta, 4–25 × 5–10 mm, petiolis 1–4 mm longis, lobis lateralibus oblongis, 1–5 × 0.5–1 mm; pedicelli fructiferi divaricati, glabri, 6–10 mm longi; petala lilacina, obovata, 4.5–6 × 2–3 mm; unguibus dense pilosis, 2–2.5 mm longis; filamenta mediana ad basim connata et glabra, 2.5–3 mm longa; fructus lineari, compressi, arcuati, 2–2.5 cm × ca. 1.2 mm.

Herbs biennial, 7–15 cm tall, sparsely covered with crisped trichomes to 0.5 mm long. Stems branched basally, unbranched above, sparsely pilose or glabrescent. Basal and lowermost stem leaves petiolate; petiole 0.5–1.5 cm long; leaf blade lanceolate, pinnatisect to pinnatifid, 1–2.5 × 0.4–1 cm, apex acute. Stem leaves with petioles 1–4 mm long, blades narrowly lanceolate, 0.4–2.5 × 0.5–1 cm, glabrescent to pilose, pinnatisect, apex acute; lateral lobes oblong, 1–5 × 0.5–1 mm. Fruiting pedicels divaricate, slender, glabrous, 6–10 mm long. Sepals oblong, 2.5–3 × 1.2–1.5 mm, sparsely pilose to glabrescent. Petals lilac, obovate, 4.5–6 × 2–3 mm, apex rounded; claw 2–2.5 mm, pilose. Filaments of median stamens 2.5–3 mm long, united at base, glabrous; lateral stamens 1.5–2.5 mm long, glabrous; anthers oblong, 1–1.1 mm long. Ovules 14 to 16 per locule. Fruit linear, compressed, 2–2.5 cm × ca. 1.2 mm, arcuate; valves sparsely pubescent basally when young, soon glabrescent, with a distinct midvein; gynophore obsolete; style ca. 0.5 mm long. Seeds oblong, ca. 1.3 × 0.7 mm. Flowering and fruiting in April.

Synstemon lulianlianus, which is named in honor of our colleague Lu Lianli (NAS), an expert on Chinese Brassicaceae, is known thus far only from the type collection. The species is readily distinguished from *S. petrovii* by its pinnatisect lanceolate leaves instead of narrowly linear entire leaves. Other differences are given in the key above.

Acknowledgments. We are grateful to Tatyana Shulkina for her help with the translation of Russian literature, as well as to Neil A. Harriman for his review of the manuscript.

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Chorispora tashkorganica (Brassicaceae), a New Species from Xinjiang, China

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ABSTRACT. *Chorispora tashkorganica*, a narrow endemic to western Xinjiang, China, is described and illustrated. Its relationships and distinguishing characters are discussed.

During work on the genus *Chorispora* R. Brown for the forthcoming volume eight of the *Flora of China*, we examined all of the recognized species except the two described by Pachomova (1974) from central Asia. However, on the basis of the detailed original descriptions she gave, it appears that *Chorispora pamirica* Pachomova and *C. insignis* Pachomova are synonyms of *C. songarica* Schrenk and *C. sibirica* (L.) DC., respectively. Among the extensive Chinese material we examined, two collections clearly belong to an undescribed species, hereafter known as *C. tashkorganica*. Regardless of the ultimate placement of Pachomova's two taxa, they are quite different from the new species in having obovate petals 10–12 mm long, compared to the much shorter (3–4 mm long) oblanceolate petals of *C. tashkorganica*.

As presently delimited, *Chorispora* consists of 11 species centered primarily in central and southwestern Asia, with the range of one weedy species, *C. tenella* (Pallas) DC., extending throughout Europe and introduced elsewhere in the world. The 11 species of *Chorispora* are easily separated by the following key.

1a. Plants perennial with a caudex; flowering stems leafless or rarely 1-leaved.
  2a. All flowers on solitary pedicels arising from rosette . . . . . *C. bungeana* Fischer & C. A. Meyer
  2b. Flowers always in racemes.
    3a. Flowers purple.
      4a. Sepals 3–4 mm long; petals 6–10 mm long; pedicel 0.3–1(–1.5) cm long; fruiting style 1.5–3 mm long . . . . . *C. sabulosa* Cambessèdes
      4b. Sepals 6–7 mm long; petals 15–18 mm long; pedicel (1.7–)2–3.5(–5.5) cm long; fruiting style 5–7 mm long . . . . . *C. greigii* Regel
    3b. Flowers yellow.
      5a. Leaves pinnatisect; petals 12–15 × 5–7 mm; sepals oblong, 5.5–7 mm long . . . . . *C. songarica* Schrenk
      5b. Leaves subentire, sinuate-dentate, to pinnatifid; petals 5–8(–10) × 2–4 mm; sepals ovate, 2–3(–3.5) mm long . . . . . *C. macropoda* Trautvetter
1b. Plants annual; flowering stems leafy.
  6a. Flowers yellow.
    7a. Petals narrowly oblanceolate, 3–4 × 0.7–1 mm, rounded at apex; anthers 0.5–0.9 mm long; style 2–4 mm long in fruit; fruiting pedicels suberect to ascending, subappressed . . . *C. tashkorganica* Al-Shehbaz et al.
    7b. Petals broadly obovate, 6–20 × 3–7 mm, apex emarginate; anthers 1.5–2 mm long; style 5–25 mm long in fruit; fruiting pedicels divaricate to recurved.
      8a. Petals 6–9(–12) mm long; fruit 1.5–2 cm × 1–1.5(–2) mm; style 5–9 mm long; fruiting pedicels (6–)7–10(–14) mm long . . . . . *C. sibirica* (L.) DC.
      8b. Petals 10–18(–20) mm long; fruit 2–3(–4) cm × 2.5–3.5(–5) mm; style 10–18(–25) mm long; fruiting pedicels 3–5 mm long . . . . . *C. iberica* (Bieberstein) DC.
  6b. Flowers purple.
    9a. Petals oblanceolate, 8–10(–12) mm long; sepals 3–5(–6) mm long . . . . . *C. tenella* (Pallas) DC.
    9b. Petals broadly obovate, (12–)14–

Figure 1. *Chorispora tashkorganica* Al-Shehbaz, T. Y. Cheo, L. L. Lu & G. Yang. —A. Plant. —B. Gland. —C. Sepal. —D. Petal. —E. Median stamen. —F. Fruit and pedicel. Scale: A = 1 cm; B = 0.1 mm; C–E = 1 mm; F = 5 mm. Drawn by Al-Shehbaz from the holotype.

18(–20) mm long; sepals 7–10 mm long.

10a. Fruiting style much longer than fruit, curved distally; fruit excluding style ca. 1 cm long . . . . . *C. persica* Boissier

10b. Fruiting style at most as long as fruit, straight; fruit excluding style 1.5–3 cm long . . . . . *C. purpurascens* (Banks & Solander) Eig

Chorispora tashkorganica Al-Shehbaz, T. Y. Cheo, L. L. Lu & G. Yang, sp. nov. TYPE: China. Xinjiang: Taxkorgan (pronounced as Tashkorgan), Subashi, 4000 m, 30 June 1987, *Qinghai-Tibet Team 870314* (holotype, KUN). Figure 1.

Herba annua glandulosa; caules 12–20 cm longi; folia basalia rosulata, numerosa, petiolata, pinnatisecta vel sinuato-dentata, lobis lateralibus deltoideis; pedicelli fructiferi suberecti vel adscendentes, subapressi, glandulosi, 1.5–3 mm longi; sepala ovata, 2–3 mm longa; petala lutea, 3–4 × 0.7–1 mm, oblanceolata, apice rotundata; fructus cylindrico-lineari, 1.2–1.5 cm × 1.5–2 mm, glandulosi, valde torulosi, articulis lateralibus 5–8; stylus 2–4 mm longus; semina oblonga, ca. 1.4 × 1 mm.

Herbs annual, 12–20 cm tall, densely glandular throughout, sparsely pubescent at apices of sepals and lobes of young leaves with simple trichomes to 1 mm long, glabrous elsewhere. Stems several from base, decumbent, unbranched. Basal leaves rosulate; petiole 0.5–2.5 cm long, not ciliate, expanded at base; leaf blade linear to linear-lanceolate in outline, 1–5 cm × 1–10 mm, densely glandular, base attenuate, margin pinnatisect to sinuate-dentate, apex acute; lateral lobes deltate, acute, smaller than terminal lobe. Cauline leaves few, similar to basal ones but with fewer lobes. Flowers in racemes, elongated considerably in fruit. Fruiting pedicel 1.5–3 mm long, glandular, ascending to suberect, subappressed. Sepals yellowish, ovate, 2–3 × ca. 1 mm, glandular, margin membranous. Petals yellow, 3–4 × 0.7–1 mm; blade oblanceolate, rounded at apex; claw 2–2.5 mm long. Filaments 2–3 mm long; anthers oblong, 0.5–0.9 mm long. Fruit cylindric-linear, 1.2–1.5 cm × 1.5–2 mm (excluding style), corky, strongly torulose and with 5 to 8 lateral articulations on each side, glandular; style 2–4 mm long. Seeds brown, oblong, ca. 1.4 × 1 mm. Flowering and fruiting June–July.

Chorispora tashkorganica is known thus far only from rocky slopes at 4000–4200 m in Taxkorgan Xian, Xinjiang. It is most closely related to *C. sibirica* and *C. iberica*, both of which are also annuals with yellow flowers. The new species is readily separated by its smaller petals and anthers, shorter styles, and appressed, suberect to ascending vs. divaricate fruiting pedicels (see key).

Paratype. CHINA. **Xinjiang:** Taxkorgan, Majin, rocky slope, 4200 m, 3 July 1987, *Qinghai Tibet Team 870405* (KUN).

Acknowledgments. We thank Wu Sugong (KUN) for sending his collections from Xinjiang for our study, as well as Neil A. Harriman for his review of the manuscript.

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Stigmaphyllon hispidum (Malpighiaceae), a New Species from Bahia, Brazil

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ABSTRACT. *Stigmaphyllon hispidum*, a new species of Malpighiaceae, is described from Bahia, Brazil, where it was collected in a remnant of coastal forest, a vegetation type called Mata Atlântica. Its floral structure and adaxial laminar vesture are most similar to those of *S. gayanum*, an endemic of the region of Rio de Janeiro. The dense axial vesture, composed of simple basifixed hairs mixed with Y-shaped hairs, is unique in the genus.

Stigmaphyllon is one of the wing-fruited genera of neotropical Malpighiaceae. The species are typically vines with long-petioled, elliptical to cordate leaves and bear clusters of yellow flowers arranged in compound inflorescences. In most the styles bear lateral appendages, the folioles, for which the genus is named. My monograph of *Stigmaphyllon* (Anderson, 1997a) includes 90 species, distributed in the West Indies and throughout Latin America from southern Mexico to northern Argentina, except in Chile. A recent collection from eastern Bahia, Brazil, proved to represent yet another species, which is described here.

Stigmaphyllon hispidum C. Anderson, sp. nov. TYPE: Brazil. Bahia: Mpio. Una, Fazenda Jureana, ramal com entrada no Km 18 da Rodovia Una/São José da Vitória, Mata Higrófila Sul Baiana (Mata Atlântica), 22 July 1998, *L. A. Mattos Silva et al. 3833* (holotype, CEPEC; isotype, MICH). Figure 1.

Liana, caulibus axibus petiolisque hispidis, indumento pilis simplicibus et pilis Y-formibus immixtis. Laminae 17.5–18 cm longae, 14–16 cm latae, late ovatae vel suborbiculares, supra velutinae, subtus tomentosae, margine sparsim glanduloso; petioli crassi, ca. 4.5 mm diametro. Inflorescentia thyrsiformis constata ex umbellis, floribus in quaque umbella 18–25(–30); pedunculi (7.5–)9–10.5 mm longi, pedicelli 4.5–8 mm longi. Petala lateralia limbo orbiculari, margine eroso-denticulato; petalum posticum limbo late elliptico, margine fimbriato-denticulato. Stamina heteromorpha, antheris pubescentibus; antherae sepalis antico-lateralibus oppositae 1–2 loculis reductis instructae, antherae sepalis postico-lateralibus oppositae steriles. Stylus anticus ca. 3.2 mm longus, utroque foliolo ca. 1.5 mm longo, ca. 1.2 mm lato, rectangulari; styli postici ca. 4.5 mm longi, foliolo ca. 3 mm longo, ca. 2.5 mm lato, subquadrato. Samara ignota.

Vine. Stems and branches densely hispid, the hairs erect, mostly simple and basifixed, (0.5–)1–2.3 mm long, also with some Y-shaped hairs, the stalk 0.05–0.7 mm long, the arms 0.1–0.5 mm long and at an acute to right angle to each other, the second arm occasionally reduced to a spur. Leaves alternate?; laminas 17.5–18 cm long, 14–16 cm wide, broadly ovate to suborbicular, apex obtuse-mucronate, base truncate to shallowly cordate, adaxially velutinous, the hairs erect, mostly Y-shaped, with the stalk 0.1–0.7 mm long and the arms 0.1–0.6 mm long, at an acute to right angle to each other, also with some simple basifixed hairs, 0.2–1.1 mm long, abaxially densely tomentose with T-shaped hairs (stalk 0.1–0.6 mm long, trabecula 0.6–1.3 mm long, straight or wavy); the midrib, primary, and secondary veins prominulous above and prominent below, and on both sides more densely pubescent than the laminar surface; laminar glands 0.2–0.3 mm diam., irregularly spaced, prominent or slightly raised, borne adjacent to the margin abaxially and hidden by the vesture; petioles 3–3.5 cm long, ca. 4.5 mm diam., densely hispid like the stems, not confluent across the node, with a pair of prominent but sessile glands at the apex, each gland 0.2–0.3 mm diam.; stipules not seen (obscured by the stem vesture?). Flowers 18 to 25 (to 30) per umbel, these borne in dichasia or small thyrses (axes to the 3rd order, hispid), the compound inflorescence axillary. Peduncles (7.5–)9–10.5 mm long, pedicels 4.5–8 mm long, terete, both densely pubescent with T-shaped hairs, peduncles (1.3–)1.4–2 times as long as the pedicels. Bracts and bracteoles 1.8–2 mm long, 0.8–1.2 mm wide, oblong to ovate, apex acute or obtuse, densely sericeous abaxially, eglandular. Sepals 2.8–3 mm long and wide, glands ca. 2 mm long, ca. 1 mm wide. All petals with the limb glabrous, yellow, limbs of lateral petals orbicular, margin erose-denticulate, the teeth up to 0.3 mm long; anterior-lateral petals: claw ca. 1.5 mm long, limb 11.5–12 mm long and wide; posterior-lateral petals: claw ca.

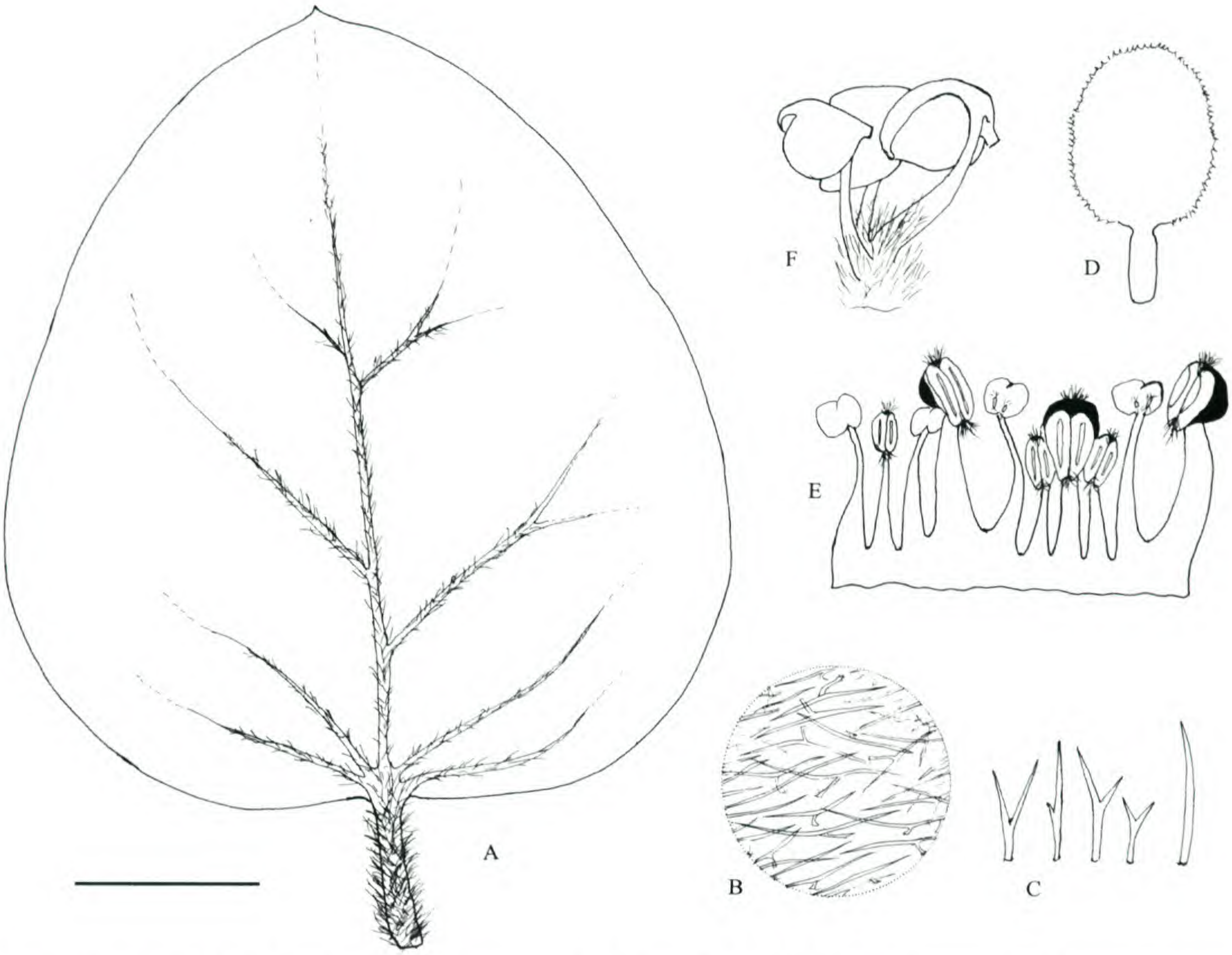

Figure 1. *Stigmaphyllon hispidum* C. Anderson. —A. Outline of leaf. —B. Detail showing abaxial laminar vesture. —C. Y-shaped hairs and a simple hair from the adaxial laminar vesture. —D. Posterior petal (the "flag"). —E. Androecium; stamen second from left opposes the posterior petal. —F. Gynoecium; anterior style at left. Scale bar: A = 4 cm, B = 1.3 mm, C = 3 mm, D = 8 mm, E, F = 4 mm.

1 mm long, limb ca. 10.5–11 mm long and wide; posterior petal: claw ca. 3.5 mm long, indented at apex, limb ca. 8.5 mm long, ca. 7 mm wide, broadly elliptical, margin fimbriate-denticulate, the fimbriae/teeth up to 0.3 mm long. Stamens unequal, those opposite the posterior-lateral petals (and the posterior styles) the largest, those opposite the anterior-lateral sepals with the filaments subequally long, anthers of those opposite the lateral sepals with the connective enlarged, those opposite the anterior-lateral sepals with 1 or 2 unequal reduced locules, those opposite the posterior-lateral sepals eloculate; loculate anthers pubescent. Stamen opposite anterior sepal: filament ca. 2.8 mm long, anther ca. 1.2 mm long; stamens opposite anterior-lateral petals: filaments ca. 1.8 mm long, anthers ca. 1 mm long; stamens opposite anterior-lateral sepals: filaments ca. 3.8 mm long, connectives ca. 1 mm long, locules 0.1–0.3 mm long; stamens opposite posterior-lateral petals: filaments ca. 3.8 mm long, anthers ca. 1.4 mm long; stamens opposite posterior-lateral sepals: filaments ca. 2.8 mm long, connectives ca. 1 mm long, locules absent; stamen opposite posterior petal always shorter than the adjacent two: filament ca. 2.5 mm long, anther ca. 1 mm long. Anterior style ca. 3.2 mm long, shorter than the posterior two, terete, glabrous, erect or slightly incurved; each foliole ca. 1.5 mm long, ca. 1.2 mm wide, rectangular. Posterior styles ca. 4.5 mm long, terete, the proximal ⅔–¾ with scattered hairs adaxially, lyrate; foliole ca. 3 mm long, ca. 2.5 mm wide, subsquare. Samara not seen.

This robust and showy species, known only from the type collection, was found in a remnant of native forest in a cocoa plantation. The common practice of retaining native trees to provide shade for *Theobroma cacao* has resulted in the patchy preservation of the native vegetation of coastal Bahia, which is rich in endemics.

Stigmaphyllon hispidum is easily recognized and readily distinguished from all other species of the genus by the densely hispid stems, axes, and unusually stout petioles. The vesture is composed of

a unique mixture of Y-shaped hairs and of simple basifixed hairs (Fig. 1C); the latter are not found elsewhere in *Stigmaphyllon*, although they are known sporadically in other genera, e.g., *Pterandra hirsuta* C. Anderson (Anderson, 1997b). At least in *S. hispidum*, the simple hairs may result from the loss of one arm in a Y-shaped hair. The arms of the Y-shaped hairs are often unequally long; sometimes the second arm is reduced to a mere spur. In *S. hispidum* the laminas are abaxially tomentose, the hairs T-shaped, but adaxially velutinous, again the vesture a mixture of Y-shaped and simple hairs.

An intriguing aspect of *S. hispidum* is the alternate arrangement of the leaves and the inflorescence axes; however, the two specimens I have seen consist of only a short portion of stem (3 cm, one node; 7 cm, two nodes), each with one large compound inflorescence borne in one leaf axil. The shift from an opposite arrangement to an alternate one near and in the inflorescence occurs in other species of *Stigmaphyllon* (e.g., *S. alternifolium* Adr. Jussieu, *S. cavernulosum* C. Anderson) and other opposite-leaved vines. The only species with apparently truly alternate phyllotaxy is *S. alternans* Triana & Planchon, of Amazonian Colombia, Ecuador, and Peru; perhaps future collections of *S. hispidum* will reveal that it is a second alternate-leaved species.

Stigmaphyllon hispidum is most similar to *S. gayanum* Adr. Jussieu, endemic to the area of Rio de Janeiro. Working *S. hispidum* through my key to the genus and the regional key (Anderson, 1997a), the reader would arrive at that species, which, of course, lacks the unique vesture of *S. hispidum*. Both have adaxially velutinous laminas, and a similar androecium and gynoecium. *Stigmaphyllon gayanum* also differs in its smaller laminas (4.7–14 cm long), the basal glands often borne on the slim petiole (1–2 mm in diameter) well below the base of the lamina, and in its petals, all with fimbriae up to 0.5 mm long. In *S. hispidum* the large laminas (17.5–18 cm long) are borne on stout petioles ca. 4.5 mm in diameter and bear a pair of prominent glands at the base of the lamina at the apex of the petiole. The margin of the posterior petal is fimbriate-denticulate and of the lateral petals erose-denticulate. The only other species with adaxially velutinous laminas is the Colombian *S. velutinum* Triana & Planchon, which also has much smaller leaves than *S. hispidum* and all petals glandular-digitate-fimbriate. *Stigmaphyllon velutinum* also differs in details of the androecium and gynoecium. All anthers are glabrous and loculate; only those of stamens opposite the anterior-lateral sepals have reduced locules. The styles bear only a narrow lateral lip instead of folioles.

Acknowledgments. I thank André M. Amorim of CEPEC for calling my attention to the type collection and William R. Anderson for his helpful comments. For this study, I also consulted the rich collection of Malpighiaceae at MICH. Figure 1B was drawn by Karin Douthit.

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A New Species of *Simira* (Rubiaceae, Rondeletieae) from Northeastern Brazil

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ABSTRACT. The new species *Simira gardneriana* M. R. Barbosa & A. L. Peixoto from northeastern Brazil is described. This is the first species of *Simira* found in the "caatinga" vegetation.

Simira Aublet (Rubiaceae, Rondeletieae) is a neotropical genus comprising about 40 tree species, ranging from Mexico to Brazil. Although a regional treatment of *Simira* from Brazilian Amazonia was recently published (Barbosa & Peixoto, 1989), the last comprehensive treatment of the genus for Brazil was that of Schumann (1889) for *Flora Brasiliensis*. During the study of collections of Rubiaceae from northeastern Brazil, this previously undescribed species was discovered by the first author.

Simira gardneriana M. R. Barbosa & A. L. Peixoto, sp. nov. TYPE: Brazil. Ceará: Campos Sales, Salitre, caatinga, 10 Feb. 1984, *A. Fernandes & M. A. Figueiredo 12298* (holotype, JPB; isotype, EAC). Figure 1.

Species nova a congeneris *S. grazielae* et *S. viridiflora* dimensionibus petioli et foliorum sed etiam axillis nervorum barbatis, corolla ventricosa 6–7 lobata et staminibus numero aequali distinguitur.

Small tree 4–7 m tall, cortex gray, reddish inside; branchlets terete, grayish, rarely reddish, glabrous, with lenticels. Leaves concentrated in the apices of branchlets, oblong-lanceolate, apex short acute, slightly apiculate, base obtuse or rounded, chartaceous, glabrous, younger reddish, mature olive-green, 4.5–6 cm long, 2.5–3 cm wide; petioles slender, puberulous, 5–7 mm long; secondary veins 8–10 pairs, prominent above and beneath, intersecondary veins reticulate, with hairy domatia in the axils of the secondary veins; terminal stipules 0.8–1 cm long, narrowing toward the apex, externally puberulous at base, with one row of colleters on the internal stipule base. Inflorescences axillary, short; thyrses 7–12-flowered, peduncles puberulous, 1.5–2 cm long; bracts foliose 2, at apex of the peduncle, membranaceous, deciduous, 1–1.5 cm long. Flowers subsessile, hypanthium puberulous, 3.8–4(–5) mm long. Calyx campanulate, truncate, internally glabrous, externally glabrous, 2(–4) mm long. Corolla bellying, 6–8(–9) mm long, externally glabrous, internally glabrous except at the point of filament attachment, imbricate, lobes 6–7, 3–4 outside, 3 inside, rounded, ciliolate, ca. 1 mm long, the inside smaller than the outside ones, irregularly tripartite at anthesis, then reflexed. Stamens 6–7, filaments exserted, attached ca. 1.5 mm from the corolla base, 5–5.5(–7) mm long, hirsute in basal ⅔; anthers apiculate, 2.5–3 mm long. Style glabrous, bifid, at anthesis ca. 7 mm long. Capsules globose, woody, with lenticels, 3.5–4.5 cm diam., 2-valved, valve bipartite, each part ca. 2.5 cm long, 1.6 cm wide, 0.35–0.4 cm thick; seeds numerous, flat, crescent-shaped, 1.8–3.5 × 0.9–1.5 cm, drying gold, wings slender.

Simira gardneriana occurs in the states of Bahia, Ceará, Pernambuco, and Piauí, in the caatingas dominium, where it is known as Pereiro-de-Tinta or Pereiro-Vermelho. The wood is used in buildings and fences; during the dry season this species is used as forage. This is the first reference of the genus, which is typical of humid forests, occurring in the caatinga vegetation. The caatinga is a type of vegetation that occurs in northeastern Brazil where the majority of species, under severe and long-lasting periods of drought, lose their leaves. The currently known specimens of this species occur in areas of poor sandy soil with 500–700 mm annual rainfall.

Simira gardneriana is very closely related to *S. grazielae* Peixoto and *S. viridiflora* (Allemão & Saldanha) Steyermark, which occur in the humid forests of eastern Brazil (Peixoto, 1981). These species

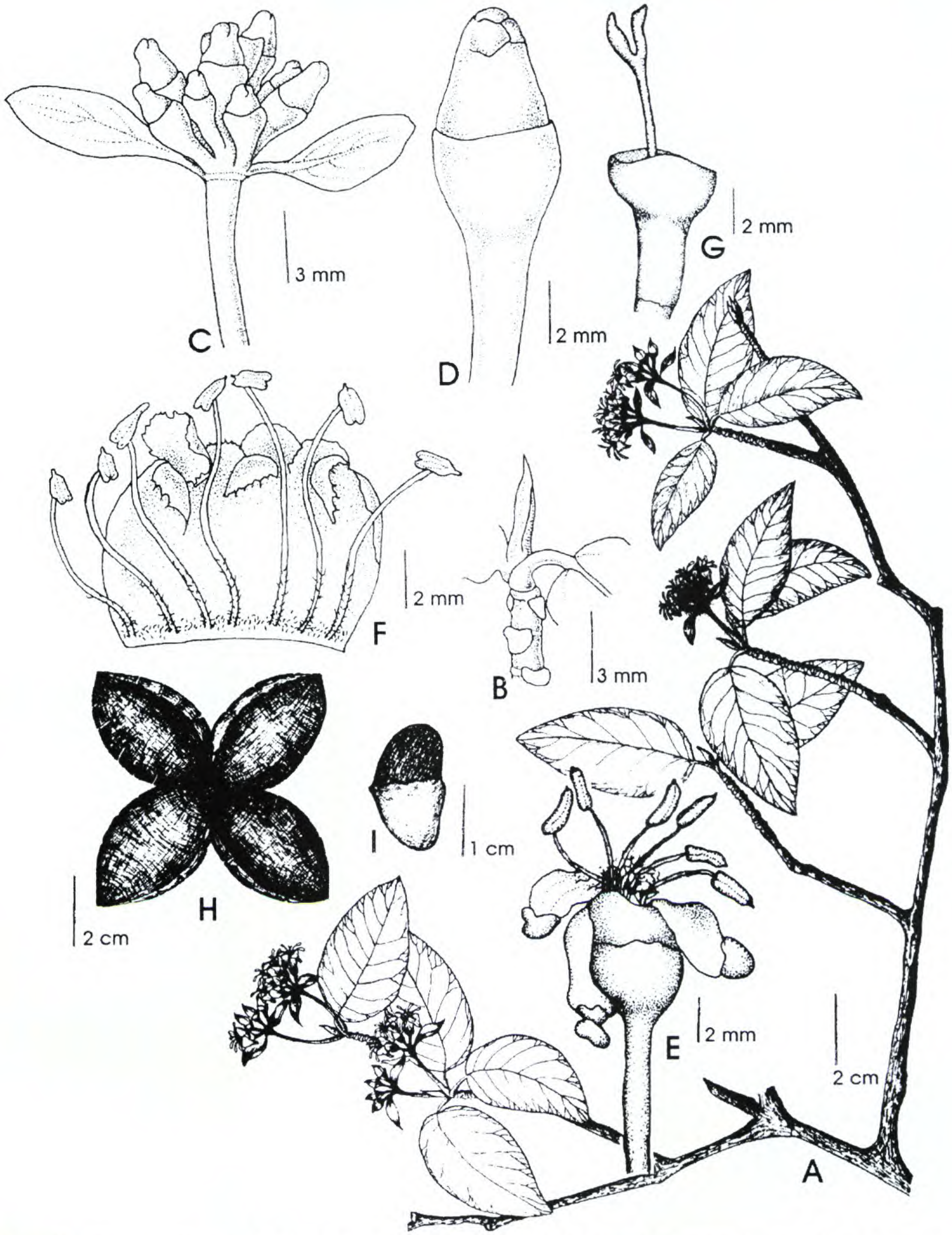

Figure 1. *Simira gardneriana* M. R. Barbosa & A. L. Peixoto. —A. Habit. —B. Terminal stipule. —C. Inflorescence. —D. Flower bud. —E. Flower. —F. Open corolla. —G. Hypanthium and style. —H. Open fruit. —I. Seed. (A–G, *A. Fernandes & M. A. Figueiredo 12298;* H, I, *D. Andrade-Lima & M. Magalhães 52–1063.*)

have in common an imbricate corolla aestivation that opens irregularly in three or two portions and capsules strongly woody, bivalved, with valve bipartite. *Simira gardneriana* differs in having shorter petioles, hairy domatia, and higher numbers of corolla lobes and stamens (Table 1).

The name honors George Gardner, Scottish naturalist, the first collector of the species, who was

Table 1. Comparison of *Simira gardneriana*, *S. grazielae*, and *S. viridiflora*.

Characters	*S. gardneriana*	*S. grazielae*	*S. viridiflora*
Habit	Tree to 7 m	Tree to 30 m	Tree to 20 m
Blade dimension	4.5–6 × 2.5–3 cm	6–13 × 2.8–5 cm	12–42 × 3–13 cm
Domatia	Hairy	Pocket	Hairy
Petioles	5–7 mm	2 cm	1–2.2 cm
Lobes and stamens	6–7	4–5	4
Capsule dimensions	3.5–4.5 cm	6–7 cm	6–7 cm

responsible for a historical collection of plants made in northeastern Brazil from 1836 to 1841.

Paratypes. BRAZIL. **Bahia:** Senhor do Bonfim, 25 May 1974 (fr), *D. Andrade-Lima 74-7665* (IPA). **Ceará:** Aiuaba, 8 Jan. 1982 (fl), *M. A. F. Gomes s.n.* (EAC 11058, UB, JPB, IPA). **Pernambuco**: Petrolina, 5 Jan. 1961 (fr), *D. Andrade-Lima 61–3601* (IPA, JPB); 8 km NE Petrolina, caatinga arbustiva, 28 Dec. 1983 (fl), *Fotius 3661* (IPA); próx. Serra Dois Irmãos, estr. Afrânio–Paulistana, 23 June 1952 (fr), *D. Andrade-Lima & M. Magalhães 52–1063* (IPA); Afrânio, 20 Apr. 1971 (fr), *E. P. Heringer et al. 200* (IPA). **Piauí:** próximo Boa Esperança, 1839 (fl), *G. Gardner 2313* (K); Fronteiras, 17 June 1980 (fr), *S. Jordy Filho 112* (IPA); Paulistana, 2 Dec. 1979 (fl, fr), *A. Fernandes & Del'Arco s.n.* (EAC 7508, UB); São Raimundo Nonato, 12 Dec. 1978 (fl), *A. Fernandes s.n.* (EAC 5112, UB); Serra da Capivara, 1979 (fl), *L. Emperaire 370* (IPA).

Acknowledgments. We are grateful to the British Council in Brazil for supporting the first author's visit to the Royal Botanic Gardens, Kew, and to the Conselho Nacional de Desenvolvimento Científico e Tecnológico of Brazil (CNPq) for grants to the authors that partially funded this work. We also thank the curators of K, EAC, and IPA for allowing the study of specimens.

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Two New Combinations in *Maianthemum* (Convallariaceae)

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ABSTRACT. During preparation of the account of *Maianthemum* F. H. Wiggers for the *Flora of China*, volume 24, it was found that two taxa formerly treated under *Smilacina* Desfontaines required the following new combinations in *Maianthemum*, namely *M. fusciduliflorum* (Kawano) S. C. Chen & Kawano and *M. stenolobum* (Franchet) S. C. Chen & Kawano.

The genus *Maianthemum* (including *Smilacina*) consists of about 35 species and is widely distributed in the northern temperate zone as well as subtropical montane Asia and Central America. Two genera, *Smilacina* and *Maianthemum*, have been recognized traditionally and historically. LaFrankie (1986) concluded that the difference between them (trimerous vs. dimerous flowers) was not sufficient to warrant distinct genera, and therefore transferred the species of *Smilacina* to *Maianthemum*. Along with Li (1990) and Hara (1987), the present authors agree with LaFrankie's transfers and note that the following combinations are necessary for their forthcoming treatment of *Maianthemum* in the *Flora of China*, volume 24 (Chen & Kawano, in press).

Maianthemum fusciduliflorum (Kawano) S. C. Chen & Kawano, comb. nov. Basionym: *Smilacina fusciduliflora* Kawano, J. Jap. Bot. 41: 354. 1966. TYPE: Myanmar-China (Xizang). "Burma-Tibet Frontier: Adunq [sic = Adung] Valley, alt. 12000 ft," 26 June 1931, *F. Kingdon-Ward 9706* (holotype, F).

This species occurs from 2200 to 3600 m in southeastern Xizang and northwestern Yunnan provinces of China, as well as in adjacent Myanmar. It has violet tepals free to the base of the perianth, whereas the closely related species *Maianthemum lichiangense* (W. W. Smith) LaFrankie and *M. tubiferum* (Batalin) LaFrankie have white or violet-tinged tepals connate at their bases to form a tube. *Maianthemum lichiangense* occurs from 2800 to 3500 m in southern Gansu, Sichuan, northwestern Yunnan, and possibly Shaanxi provinces, and *M. tubiferum* occurs from 2500 to 3000 m in Gansu, Hubei, Qinghai, Shaanxi, and Sichuan provinces; both are endemic to China.

Maianthemum stenolobum (Franchet) S. C. Chen & Kawano, comb. nov. Basionym: *Tovaria stenoloba* Franchet, Bull. Soc. Bot. France 43: 47. 1896. *Smilacina stenoloba* (Franchet) Diels, Bot. Jahrb. Syst. 29: 247. 1900. *Smilacina paniculata* (Baker) F. T. Wang & Ts. Tang var. *stenoloba* (Franchet) F. T. Wang & Ts. Tang, Fl. Reipubl. Popularis Sin. 15: 32. 1978. *Smilacina tatsienensis* (Franchet) H. R. Wehrhahn f. *stenoloba* (Franchet) H. Hara, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 14: 155. 1987. *Smilacina tatsienensis* var. *stenoloba* (Franchet) D. M. Liu, in J. M. Xu, Fl. Sichuan. 7: 202. 1991. *Maianthemum tatsienense* (Franchet) LaFrankie var. *stenolobum* (Franchet) H. Li, in Z. Y. Wu et al., Fl. Yunnan. 7: 744. 1997. TYPE: China. Chongqing: "près de Tchen kéou tin [Chengkou]," *Farges 593 bis* (holotype, P).

This species is endemic to China, occurring from 2000 to 3000 m in southern Gansu, western Hubei, and Chongqing (formerly eastern Sichuan) provinces. It has narrowly lanceolate, 5–7-mm-long inner tepals, whereas the closely related species, *Maianthemum gongshanense* (S. Yun Liang) H. Li and *M. trifolium* (L.) Sloboda, have obovate or oblong, 2–4.5-mm-long inner tepals. *Maianthemum gongshanense* occurs from 3400 to 3600 m in western Yunnan Province, where it is endemic, and *M. trifolium* occurs from 400 to 700 m in Heilongjiang, Jilin, and possibly Nei Mongol provinces of China, as well as northern Korea, Russia, and North America.

Acknowledgments. We thank Anthony R. Brach (MO c/o Harvard) and Nicholas J. Turland (MO, St. Louis) for help in preparing the manuscript.

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A New Combination in *Stuckenia* (Potamogetonaceae) of South America

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ABSTRACT. In this work, we propose the new combination *Stuckenia punensis* (Galán de Mera) Galán de Mera for use in the Peruvian flora. This species is coincident with *S. filiformis* in its distribution in the high Andes of Peru. *Stuckenia punensis* differs from *S. filiformis* in its wider, scabrous leaves and globose achenes.

On account of the recent revision of the worldwide genus *Potamogeton* L. (Wiegleb & Kaplan, 1998), we elucidate some points regarding the family Potamogetonaceae in South America.

Recent articles on Potamogetonaceae in America include Standley and Steyermark (1958), Haynes (1974), Haynes and Wentz (1975), Haynes and Holm-Nielsen (1982), Tur (1982), Haynes (1985), and Galán de Mera (1991). After reviewing the nomenclatural novelties of Les and Haynes (1996) and Haynes et al. (1998), we propose an additional new combination of *Stuckenia* for the Peruvian flora.

Stuckenia punensis (Galán de Mera) Galán de Mera, comb. nov. Basionym: *Potamogeton punense* Galán de Mera, Phytologia 64: 495. 1988. TYPE: Peru. Puno: Lampa (on San Román border), at road and railroad crossing of stream draining lago Jaracocha, ca. 9 km SW of Santa Lucía, 12 Jan. 1963, alt. ca. 4000 m, *H. H. & C. M. Iltis 1441, D. & V. Ugent* (holotype, USM; isotype, US).

Although Wiegleb and Kaplan (1998) suggested that *Potamogeton punense* and *P. filiformis* C. H. Persoon [*Stuckenia filiformis* (C. H. Persoon) C. Börner] are synonymous, the two species are very different in their morphological and ecological characteristics (see Table 1). *Stuckenia punensis* presents much wider leaves, with 3 to 5 nerves, thickened and scabrous. The leaves of *S. filiformis* are narrower, with only 1 nerve, and smooth. The stipules of *S. punensis* are longer (5–8 cm) than those of *S. filiformis* (1–3 cm). The achenes also differentiate the two species: in *S. punensis* they are globose and in *S. filiformis* they are gibbous. Both species are located between 3000 and 4000 m above sea level, but their ecological preferences are different; whereas *S. punensis* lives in flowing rivers, *S. filiformis* forms dense communities in high calm lagoons. Finally, *S. punensis* is a Peruvian endemic (Galán de Mera, 1991), while *S. filiformis* is widely distributed throughout the world (western, central and northern Asia, North and South America) (Wiegleb & Kaplan, 1998).

Additional specimens of Stuckenia punensis. PERU. **Cuzco:** Calca, bottom of rio Urubamba Valley at km 54, on road to Urubamba, ca. 4 km NW from Calca (8 km SE of Yucay), 2900 m, 26 Dec. 1962, *H. H. & C. M. Iltis, C. Vargas 846* (US, USM). **Junín:** Tarma, bottom of rio Quishuarcancha, below Hacienda Casa Blanca (ca. 18 km (air) SSE of Tarma), 3600 m, 28 Nov. 1962, *H. H. & C. M. Iltis, D. & V. Ugent 140* (USM); Yauli, aquatics from icy-cold, shallow, swift rio Mantaro, in limestone valley with treeless tussock, grassland along highway to Junín, ca. 8–10 km NW of La Oroya, ca. 3800 m, 4 Dec. 1962, *Hugh H. & Carolyn Iltis, Donald & Vivian Ugent s.n.* (US, USM); cerca de Paccha, entre La Oroya y Junín, Riachuelo, 3800–3900 m, 10 Jan. 1949, *Ramón Ferreyra 5259* (US).

Table 1. A comparison of *Stuckenia punensis* and *S. filiformis.*

Feature	*S. punensis*	*S. filiformis*
Leaf width (mm)	2–4	0.2–0.5
Number of leaf nerves	3 to 5	1
Texture	scabrous	smooth
Stipules (cm)	5–8	1–3
Fruit morphology	globose	gibbous
Habitat	flowing rivers	lagoons of calm waters
Chorology	Peru	W, C and N Asia, North and South America

Acknowledgments. This work was supported by the 12/98 USP project of San Pablo University and by a grant from the Agencia Española de Cooperación Internacional. We thank L. Hamalainen for her linguistic assistance.

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New Mesoamerican Species of *Dichorisandra* and *Tradescantia* sect. *Mandonia* (Commelinaceae)

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ABSTRACT. Two new species of Commelinaceae are described from the Neotropics. *Dichorisandra amabilis* J. R. Grant, widespread from southern Mexico to Panama, consists of erect herbs formerly included in *D. hexandra* (Aublet) Standley, which is here restricted to scandent plants. *Tradescantia petricola* J. R. Grant, disjunct from Costa Rica to Venezuela, belongs to *Tradescantia* sect. *Mandonia* D. R. Hunt.

During preparation of the treatment of the Commelinaceae for the *Manual de las Plantas de Costa Rica*, two new species were encountered. In order that they may be included within this flora, they are here described as *Dichorisandra amabilis* J. R. Grant, and *Tradescantia petricola* J. R. Grant.

DICHORISANDRA

Dichorisandra is a taxonomically difficult genus not only at its northernmost extent in Mesoamerica and Mexico, but throughout its primary range in South America. While 25+ species are recognized in South America, the name *Dichorisandra hexandra* (Aublet) Standley has previously been used for an all-encompassing species of two or more distinct elements in Mesoamerica and Mexico, e.g., Hunt (1994) in *Flora Mesoamericana*. The description here of a species that ranges from southern Mexico to Panama attempts to alleviate some of the problems within the genus at the northern extent of its range.

Dichorisandra amabilis J. R. Grant, sp. nov. TYPE: Costa Rica. Puntarenas: Cantón de Esparza, Macacona, 10°01′40″N, 84°36′33″W, 400 m, 26 July 1992, *Hammel, Castillo & Herrera 18543* (holotype, US; isotypes, CR, F not seen, INB, MO). Figure 1.

Haec species *Dichorisandrae hexandrae* affinis, sed ab ea habitu erecto, caule robustiore, foliis secus axem principalem spiraliter dispositis, secus ramos laterales distichis, vagina foliari infra glabra ad apicem subtiliter pubescente atque inflorescentia ex thyrso diffuso late ovato terminali constante distinguitur.

Free-standing, erect, single-stemmed, perennial herb to 1.5 m, upper half branched, arising seasonally from tuber-bearing roots. Roots thin, fibrous, often with distal tubers; tubers 3–5 × 0.5–1.5 cm, thick, succulent, tan. Stems robust, green to glaucous-blue, often with vertical white striations. Branches axillary, 4 to 9 in number. Leaves 6–20 × 1.5–7.5 cm, spirally arranged on the main axis, distichous on the lateral branches, sessile to petiolate, oblique, typically ovate-oblong, but varying from linear-lanceolate, ovate, elliptic, to obovate, basally acute to rounded, apically acuminate, firm but flexible, not leathery; sheaths glabrous, ciliate along the fused edge and toward the sheath summit; blades glabrous to sparsely scabrous, short-ciliate. Inflorescences raceme-like thyrses, terminal on both the main axis and the lateral branches, diffuse, broadly ovate to oblong in outline, (2–)5–8(–13) × (2–)3–5(–7) cm; peduncle 1–4 cm long, glabrous to velutinous; cymes (5) 10 to 15 (33) in number, 2–3.5 cm long, each subtended by a decrescent bract 5–60 × 2–4 mm. Flowers 2–15 per cyme, either bisexual (perfect) or male, both often blooming on a single cyme together on a given day, pedicellate. Pedicels 2–4 × 1 mm. Sepals 3, free, (5–)9–11 × 4–7 mm, unequal, green to white, glabrous, acute to obtuse to rounded at apex. Petals 3, free, 7–15 × 9–11 mm, obovate, pale blue, lilac, lavender, blue, purple, or white, rounded at apex. Stamens 6, equal, 8–11 mm long; filaments glabrous, 3–5 × 1 mm, antepetalous filaments shortly epipetalous at the base; anthers 6, dorsifixed toward the base, ovate in outline, base slightly cordate, 5–6 × 1–2 mm, dehiscing by two terminal pores, blue. Pistil 4–8 mm long; style slender, 2.5–6.0 mm; ovary glabrous, 1.5–2.0 × 1.5 mm. Capsules dehiscent, trilocular, 9–14 × 7–10 mm, oblong to obovate, often tinged purple, with 2 to 6 seeds per locule. Seeds robust, 4- to 6-sided, all sides 3.5–5.0 mm, ribbed to rugose, blackish with whitish indumentum on the sides facing other seeds, tan on the side(s) facing the wall of the locule; aril orange.

Dichorisandra amabilis ranges from the southern Mexican states of Veracruz, Oaxaca, and Chiapas

Figure 1. *Dichorisandra amabilis* J. R. Grant. —A. Habit. (A and E, *Grant & Rundell 92-02007* in cultivation.) —B. Stem and underground tuber-bearing roots. (Based on *Gómez 20749*, NY.) —C. Flowering branch. (C and D based on *Atwood & Neill AN140*, NY.) —D. Detail of leaf sheaths. —E. Inflorescence; the upper opened flower is bisexual, the lower opened flower is male.

through Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica to the Darién of eastern Panama. Future collecting may reveal its presence in both Belize and the Chocó of Colombia. It occurs from sea level to 1650 m in altitude. In contrast, *Dichorisandra hexandra* has a continuous distribution from Peru and French Guiana to Panama and Costa Rica, and is disjunct in Belize. Although *D. amabilis* and *D. hexandra* are known from both Pacific and Atlantic slopes, *D. amabilis* tends to occur (or is at least collected more frequently) on Pacific slopes, and *D. hexandra* more so on Atlantic slopes (at least in Mesoamerica). Furthermore, *D. amabilis* is most commonly found in sunny, disturbed sites often near streams or on alluvial terraces, whereas *D. hexandra* is restricted to shady primary forest.

In morphology, *Dichorisandra amabilis* can generally be distinguished from *D. hexandra* in its erect, non-scandent habit, glabrous sheaths, and broadly ovate to oblong (rather than globose to slightly ovate) inflorescences. *Dichorisandra amabilis* also approaches *D. ulei* J. F. MacBride from northern South America. The latter species, however, is a taller, more robust species with thick stems, densely villous leaf sheaths and peduncles, and generally longer (15–26 × 4–8.5 cm) leaves.

Three published names in *Dichorisandra* from northern South America were considered as potentially applicable to the erect Mesoamerican species. However, examination of their type material from Prague has revealed each to be synonymous with *D. hexandra*. These names are: *Dichorisandra ovalifolia* C. Presl, Reliq. Haenk. 1: 140. 1825; *D. inaequalis* C. Presl, Reliq. Haenk. 1: 140. 1825; and *D. mexicana* C. Presl, Reliq. Haenk. 1: 140. 1825 (likely from South America, not Mexico). These names are mentioned to indicate that each was in fact considered and eliminated, whereby it was definitively decided to name the Mesoamerican entity as a new species.

KEY TO THE NATIVE AND CULTIVATED SPECIES OF *DICHORISANDRA* IN MESOAMERICA

1a. Climbing, clambering, or trailing vines; stems slender to wiry; inflorescences terminal only on short, often remote, axillary branches, compact, globose to slightly ovate in outline; leaves always distichously arranged; leaf sheaths pilose throughout, or only along the fused edge; Belize, Costa Rica, and Panama to French Guiana and Peru . . . *Dichorisandra hexandra* (Aublet) Standley

1b. Free-standing, erect herbs; stems robust; inflorescences terminal on the main stem, also at the ends of axillary branches, diffuse, broadly ovate in outline; leaves spirally arranged at least on main axis; leaf sheaths glabrous throughout to ciliate on the fused edge.

2a. Plants with multiple stems; sepals and petals both purple; anthers yellow; leaves spirally arranged on terminal as well as axillary branches; plants of cultivation, native to southeastern Brazil . . . . . *Dichorisandra thyrsiflora* J. C. Mikan

2b. Plants with a single stem; sepals green to white, petals pale blue, lilac, lavender, blue, purple, or white; anthers blue; leaves spirally arranged on the main axis, while those on the axillary branches distichously arranged; plants native to Mexico (Veracruz, Oaxaca, and Chiapas), Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica to the Darién of eastern Panama . . . . . *Dichorisandra amabilis* J. R. Grant

Paratypes. MEXICO. **Chiapas**: Estación Biológica Chajul, *Domínguez 160* (US). **Oaxaca**: Arroyo Hamaca, *Wendt et al. 4161* (US); Sta. María, *Hernández 1204* (MO, US). **Veracruz**: Poblado 6 (La Laguna), *Wendt et al. 2674* (US); Poblado 2, *Wendt et al. 5306* (US). GUATEMALA. **Alta Verapaz**: Cubilquitz, *Tuerckheim 8325* (US). **Jutiapa**: Atescatempa, *Heyde & Lux 6393* (MO, NY, US); San Jerónimo, *Harmon & Dwyer 3331* (MO); Monson on Hwy. CA-8, *Harmon & Fuentes 5918* (MO); San Cristobol along CA-2, *Dunn et al. 23211* (MO, NY). **Petén**: San Luis, *Ortíz 2185* (US). **Sololá**: Santa Bárbara, *Shannon 245* (US). **Zacapa**: 41 mi. S of turnoff to Petén (near Morales), *Croat 41875* (MO). EL SALVADOR. **Ahuachapán**: 23 mi. NW of San Francisco Menéndez, *Croat 42088* (US); P.N. El Impossible, *Toledo 6* (MO). **La Libertad**: Los Chorros, Sta. Tecla, *Rohweder 628* (MO). **San Salvador**: San Salvador, *Renson 181* (NY, US), *Calderón 840* (US); Conchagua, *Rohweder 633* (MO). **San Vicente**: Laguna de Apastepeque, *Rohweder 624* (MO). **Santa Ana**: Río Amayo near Hacienda Agua Caliente, *Rohweder 626* (MO); Santa Ana Metapán, *Rohweder 629* (MO). **Sonsonate**: San Salvador-Sonsonate, *Rohweder 625* (MO); Salvador, 9 km E of La Libertad, *Horton 8648* (US). HONDURAS. Without exact locality, "eastern Honduras," *Townsend s.n.* (US). **Atlántida**: Tela, *Standley 52700* (US); Lancetilla, *Chickering 213* (MO), *Yuncker 4743* (MO, NY); Lancetilla Botanical Gardens, *Croat & Hannon 64592* (MO). **El Paraíso**: drainage of the Río Yeguare, *Molina R. 4041* (MO, US), *Molina R. 4124* (US); km 73 entre Ojo de Agua y Río California, *Molina R. 14489* (NY); Las Manos, Cordillera Dipilto, *Molina R. 30575* (MO). **Gracias a Dios**: Río Patuca, Wampusirpi, *Clewell 4539* (MO). **Morazán**: Barrosas, *Nolasco 130* (NY). **Olancho**: Pinares, *Nelson & Romero 4656* (MO). NICARAGUA. Without province: Segovia District, Sangsangta, *Schramm 55* (US). **Boaco**: El Portón, *Stevens 9268* (MO, US); Cerro Mombachito, *Stevens et al. 14710* (MO, US); Río Fonseca, "Los García," *Moreno 10187* (MO, US); 4 km al Oeste de Boaco, *Moreno 10201* (MO, US); Camoapa, *Stevens 22986* (MO, US). **Carazo**: La Paz de Oriente, *Moreno 10699* (MO, US). **Chinandega**: Ameya, *Maxon et al. 7114* (US), *Maxon et al. 7201* (US); Volcán Chonco, *Sandino 1377* (MO); Santo Tomás del Nance, *Moreno 11846* (MO, US); Volcán Casita, Montañas El Uval, *Grijalva & Grijalva 1458* (MO, US). **Chontales**: Cuapa, *Neill 7457* (CR, US), *Stevens 3637* (MO, US), *Nee & Sebastian 28471* (MO, US); 6 km E of Santo Tomás, *Hernández & Stevens 618* (MO, US). **Estelí**: Salto de Estanzuela, *Atwood & Neill AN140* (MO, NY,

US), *Stevens et al. 14398* (MO, US), *Castro et al. 1176* (MO, US), *Soza et al. 146* (MO, US), *Moreno 24390* (MO, US), *Hernández et al. 637* (MO, US). **Granada**: Grenada de Nicaragua, *P. Lévy 1060* (P); Volcán Mombacho, *Atwood & Neill AN186* (MO, US), *Moreno 1458* (MO, US), *Moreno 1506* (MO), *Moreno 2614* (MO, US), *Sandino 1306* (MO, US), *Sandino et al. 2906* (MO, US), *Moreno 16465* (MO, US), *Marin & Cisneros 137* (MO), *Grijalva et al. 2902* (MO, US), *Soza & Moreno 74* (MO, US); Comarca La Fuente, *Guzmán et al. 604* (MO, US). **Jinotega**: El Cedro, *Moreno 810* (MO, US). **Madriz**: San Juan de Río, *Stevens et al. 17669* (MO). **Managua**: Casa Colorada, *Maxon et al. 7375* (US); Las Nubes, *Maxon et al. 7492* (US); El Crucero, *Stevens 3511* (MO); along Hwy. 8 ca. 2.4 km SW of intersection with Hwy. 2, km 28, *Stevens 3993* (MO, US); Río Los Mangos, Hwy. 12 bridge, *Stevens 9788* (MO); carretera entre Las Conchitas y Masachapa, km 27–30, *Guzmán & Castro 1956* (MO, US). **Masaya**: Laguna de Masaya, *Neill 1034* (MO); Parque Nacional Volcán Masaya, *Neill 4647* (MO); Jardín Botánico UCA, *Sandino 3491* (MO, US). **Matagalpa**: Cerro Apante, *Sandino 1517* (MO, US); Cerro El Apante Grande, *Soza et al. 124* (MO, US); Ranchería, 11 km al NE de Muy Muy, *Moreno 24454* (MO, US). **Nueva Segovia**: Ocotal, Quebrada El Nancital, *Stevens 3086* (MO, US); San Fernando, *Stevens 3219* (MO, US). **Río San Juan**: San Bartolo, *Seymour 6212* (MO, US), *Robbins 6222* (NY); Río Indio, *Riviere 297* (MO). **Rivas**: Isla Ometepe, Volcán Concepción, La Concepción "El Floral," *Robleto 1049* (MO, US); Isla Ometepe, Volcán Maderas, "La Palma," *Robleto 1215* (MO, US). **Zelaya**: Río Punta Gorda, Atlanta, *Moreno & Sandino 12842* (MO, US); Nueva Guinea, *Araquistain 3023* (MO); Wany, *Ortiz 44* (MO, US); Santa Rosa, *Ortiz 66* (MO, US); Waspado, *Ortiz 245* (MO, US); road between Nueva Guinea and Verdún, *Miller & Sandino 1119* (MO, US); El Zapote, 6 km S of Colonia Verdún, *Nee & Vega 27888* (MO); Sector Mina Nueva América, *Ortiz 2148* (MO, US). COSTA RICA. **Alajuela**: San Ramón, *Brenes 14430* (US); San Pedro de San Ramón, *Brenes 4321* (NY), *Brenes 11* (NY); Tapesco de Zarcero, *Austin Smith 780* (NY); Zapote, *Austin Smith 914* (NY); La Peña de Zarcero, *Austin Smith 996* (NY); Quebrada Azul (San Carlos), *Brenes 23069* (NY); San Rafael de Guatuso, Grecia, *A. Jiménez 1084* (CR); Quebrada Lajas, Buena Vista de San Carlos, *A. Jiménez 2318* (CR); N of San Ramón, *Lellinger & White 1252* (CR, MO, US); 3 km NNE of Bijagua, *Burger & Baker 9836* (MO). **Cartago**: Río Aguacaliente, *Pittier 2634* (US); forêt de Tuis, Cartago, *Tonduz 11360* (US); El Muñeco, *Standley & Torres R. 51719* (US); Turrialba, *Croat 588* (MO), *Croat 590* (MO); Alto Velo de Novia, *Lent 1013* (CR); 10 km S of Tapantí, *Burger & Stolze 5626* (CR, MO, NY), *Burger & Burger 7575* (CR); Tapantí Hydroelectric Reserve, *Croat 36165* (US); Quebrada Cangreja, *Liesner & Judziewicz 14482* (MO, US). **Guanacaste**: Tilarán, *Standley & Valerio 44544* (US); Comelco Property near Bagaces, *Opler 317* (CR); Parque Nacional Santa Rosa, *Barringer et al. 4008A* (CR); Parque Nacional Rincón de la Vieja, *Rivera 664* (MO); 10 km S of Santa Cruz near Vista al Mar, *Grant & Rundell 92–02007* (CR, US). **Heredia**: El Roble, *F. L. Stevens 626* (US); Zona Protectora Q. Canta Rana Magsasay, *I. Chacón 865* (CR). **Limón**: Forêts de Tsâki, Talamanca, *Tonduz 9515* (CR); Río Reventazón below Cairo, *Standley & Valerio 49008* (US); Toro Amarillo, *Solís 23904* (CR); La Lola, *Carlson 3274* (US); 10 mi. SW of Guápiles, *Walker 181* (US); between Siquirres and the Río Pacuare, *Burger & Liesner 6972* (US); Cahuita National Park, *Hammitt 145* (CR); Lago Dabagri hasta Río Llei, *Gómez et al. 23180* (MO, US); Parque Nacional Tortuguero, Estación Agua Fría, *Robles 1215* (CR), *Robles & Flores 1625* (CR), *Solano 55* (MO, US); 12.5 km S of the San José–Limón Hwy. between Germania and Siquirres, *Grant & Rundell 92–01948* (CR, US). **Puntarenas**: forêts du Río Naranjo, *Tonduz 7657* (CR); Río Sándalo, Osa Peninsula, *Dodge & Goerger 10080* (CR, MO, NY, US); Palmar Norte, along Río Grande de Térraba, *Allen 5313* (NY, US); 8 km al SE de Golfito, *A. Jiménez 2264* (CR, NY); entre Lagarto y Boruca, *A. Jiménez 3472* (CR); Cabo Blanco Nature Reserve, *Burger & Liesner 6669* (CR, NY); Miramar turnoff, *Gentry 1330* (CR, NY); between Golfito and Río Claro, *Maas & McAlpin 1438* (CR); Barón de Esparta, *Ocampo 1307* (CR); Boruca, Buenos Aires, *Ocampo 1396* (CR); Barranca Site, about 15 mi. N of Puntarenas, *Janzen 10743* (MO); sendero entre Boca de Barranca y Cabezas, *Gómez-Laurito 6865* (CR); Esparza, Macacona, *Gómez 20749* (MO, NY, US); Corcovado National Park, *Acevedo 515* (US); Santa Elena, S of Agua Caliente, *Davidse et al. 28232* (US); Finca El Edén, km 193, R 2, *Gómez 22949* (MO, US); 7 km SE of Quepos, *Grayum & Sleeper 5925* (MO, US); Santa Elena to Coyolar de Guacimal, near Lomas Ángeles, *Hammel 17105* (CR, MO); Parque Nacional Corcovado, Sirena, Ollas Trail, *Kernan 1262* (CR, MO, US); Parque Nacional Guanacaste, Estación Maritza, *Chavarría 170* (CR, MO, US); Parque Nacional Corcovado, Estación Sirena, *Saborío 88* (INB, US); Reserva Absoluta Cabo Blanco, *Chavarría 277* (INB, MO, US); Monteverde Cloud Forest Reserve area, *Burger & Baker 9778* (CR), *Dryer 885* (CR), *Pounds 181* (MO), *Haber & Zuchowski 10759* (CR, US); Las Cruces Biological Station (Wilson Botanical Garden) area, *Raven 21803* (CR), *Raven 21896* (CR, MO), *Webster 21973* (CR), *Burch 4545* (MO), *Meerow et al. 2001* (CR), *Grayum 3361* (US), *Grayum 5599* (CR, MO, US), *Kress & Di Stilio 94–4109* (US), *Kress & Calderón 94–5207* (US). **San José**: bords du Tilirí, *Tonduz 6952* (CR), *Tonduz 8834* (US); La Palma, *Stork 438* (US), *Stork 430* (US); San Luis de Turrubales, *Valerio 653* (CR); La Palma, trail to Guápiles, *Burger 4139* (CR); Río Hondura, below Bajo La Hondura, *Taylor & Taylor 11895* (NY); Río Claro Valley below La Palma, *Burger et al. 9420* (CR); Parque Nacional Braulio Carrillo, *Gómez-Laurito 6445* (CR); Montañas Jamaica, Carara Reserve, 9°45.5′N, 84°33′W, *Grayum et al. 5867* (MO); Zona Protectora La Cangreja, *Grayum 8626* (CR); Zona Protectora El Rodeo Ciudad, Colón, *Q. Jiménez et al. 855* (CR, MO, US); Santa Rosa de Puriscal, *Morales 313* (MO); Cantón de Santa Ana, Brazil de Santa Ana, *Hammel et al. 19045* (INB, MO, US). PANAMA. **Bocas del Toro**: Water Valley, *von Wedel 970* (MO, US), *von Wedel 1431* (MO), *von Wedel 1498* (MO), *von Wedel 1542* (MO); Isla Colón, vicinity of Chiriquí Lagoon, *von Wedel 2798* (MO, US), *von Wedel 2798* (MO); Quebrada Huron on Cerro Bonyik, *Kirkbride & Duke 608* (NY); La Zorra, *Kirkbride & Duke 827* (MO, NY); 12 mi. from Río San Félix, *D'Arcy 16318* (MO, US); Fortuna Dam area, *D'Arcy 16401* (MO, US). **Chiriquí**: Puerto Armuelles, *Woodson & Schery 824* (MO, US); San Bartolomé, Península de Burica, *Woodson & Schery 883* (MO, NY); E of Gualaca, *Allen 5029* (MO); Boquete, 6 mi. N of Concepción, *Ebinger 750* (MO, US); N of San Félix, *Mori & Kallunki 6007* (MO); Cerro Colorado, Bocas Road, *Folsom & Collins 1736* (MO); Haras San Miguel, near Río Mula, *Folsom 3950* (MO, US); Volcán to Río Serano, *Folsom 4058* (MO, US); Cerro Colorado, *Folsom et al. 4793* (US); "km 85," *Him 567* (MO, NY, US); road to Río Sereno from Volcán, *Murphy 1104* (MO); Fortuna Dam area, *Churchill 5387* (MO, US). **Co-**

clé: Cerro Valle Chiquito, *Seibert 511* (MO, NY); between Las Margaritas and El Valle, *Woodson et al. 1235* (MO, NY); El Valle, La Mesa, *Gentry 5653* (MO); El Valle de Antón, *Allen 1978* (MO, NY, US); Penonomé to Coclecito, 9 km N of Llano Grande, *D'Arcy & Hammel 12297* (MO); between Río Blanco and Caña Susio, *Sytsma et al. 2468* (MO). **Colón**: Gatún, *Hayes 177* (NY); 8 km NW of Gamboa, *Nee 7598* (MO); Pipeline Road near Gamboa, *Schmalzel et al. 775* (MO). **Darién**: road from El Real to Pinogano, *Duke 5142* (MO, US). **Herrera**: road between Las Minas and Pesé, *Duke 12306(3)* (MO, NY); Alto de Las Minas, *Carrasquilla 253* (MO). **Los Santos**: 17.8 mi. S of Macaracas, *Lewis et al. 1602* (MO, NY); Loma Prieta, *Duke 11865(3)* (MO), *Lewis et al. 2209* (MO, NY); Río Pedregal, 25 mi. SW of Tonosí, *Lewis et al. 2912* (MO); Guaniquito, about 10 mi. N of Tonosí, *Luteyn & Foster 1371* (CR, MO, US). **Panamá**: Cerro Gordo, near Culebra, *Pittier 3740* (NY, US); Arraiján, *Woodson et al. 1395* (MO, NY); Salamanca Hydrographic Station, Río Pequení, *Woodson et al. 1593* (MO, NY); Río Pacora, *Bartlett & Lasser 16959* (NY); Chilibre, *Dwyer 1029* (US); Las Cruces Trail, E of Summit Gardens, *Welch 19645* (MO, NY); halfway between El Llano and Río Mamoni, *Duke 5539* (MO); Howard Air Force Base, *Tyson 1862* (MO); 2 mi. SW of Guabala, *Lewis 4345* (MO); Nuevo Emperador, *Rivera E. 10* (MO); Cerro Azul, *Croat 11517* (MO); Armour Trail, *Croat 11666* (MO); Fort Kobbe, near Indo Beach, *Sullivan 233* (MO); Farfan Beach, *D'Arcy & D'Arcy 6061* (MO), *Sullivan 576* (MO); Trocha C, Isla Bayana, Altos de Majé, *Garibaldi 197* (MO); Curundu, 9°00′N, 79°35′W, 50 m, *Hamilton 575* (MO, US); Barro Colorado Island, *Standley 31354* (US), *Standley 41139* (US), *Ebinger 547* (MO, US), *Croat 4323* (MO), *Croat 6315* (MO); Madden Dam and Forest area (Parque Nacional Soberanía), Boy Scout Camp Road, *Dwyer & Elias 7490* (MO), *Kirkbride 46* (NY), *Kirkbride & Elias 259* (MO, NY), *Hamilton & Stockwell 1150* (MO, US), *Nee 6546* (NY), *Croat 11876* (MO), *Croat & Zhu 77055* (MO). **Veraguas**: Río Dos Bocas between Escuela Agricola Alto Piedra and Calovebora, 15.6 km NW of Santa Fé, *Croat 27751* (MO); Cerro Tute, *Witherspoon et al. 8853* (MO), *McPherson 10651* (MO).

Tradescantia sect. *Mandonia* D. R. Hunt

Tradescantia petricola J. R. Grant, sp. nov. TYPE: Costa Rica. Guanacaste: Cantón de Bagaces, Parque National Palo Verde, Valle del Tempisque, Sendero Guayacán, 10°21′00″N, 85°21′00″W, 10 m, 6 Sep. 1994, *Chavarría 1035* (holotype, US; isotypes, CR not seen, INB, MO not seen). Figure 2.

Haec species *Tradescantiae velutinae* Kunth & C. D. Bouché et *T. ambiguae* Martius affinis, sed ab ambabus caulibus pedicellis et sepalis glabris ab illa sepalis longioribus atque seminibus majoribus, robuste costatis, nigriscentibus, 2–3.3 × 1.2–1.5 mm metientibus distinguitur.

Robust perennials, rather clumsily erect to somewhat decumbent, arising seasonally from tuber-bearing roots, not rooting at the nodes. Stems green, suffused with reddish purple between vertical white striations, from a distance appearing checkered from the green of the stem and whitish green of the sheaths. Leaves spirally arranged, succulent; sheaths 0.5–1.5 cm long, markedly different in color from the blade, whitish or with green tinge with vertical veins standing out in light green, just shorter in length than the leaf internodes, glabrous, blades sessile, (5–)13–23 × (1–)3–5 cm, lanceolate-oblong with a strong-impressed false midrib, acuminate to acute at apex, rounded to cordate at base, glabrous and lustrous above, the stomates so large as to give a pocked appearance to the blade; abaxial surface puberulous; leaf margins maroon, entire, undulate to crispate, ciliolate; leaves strongly decrescent on the flowering shoot. Inflorescences terminal and axillary, sessile to subsessile. Bracts strongly unequal when paired, acuminate, 8–60 × 3–15 mm, with vestiture as in the leaves. Pedicels glabrous, green, erect, white below, 11–13 mm long, recurved after flowering. Flowers bisexual, without any noticeable scent, 15–20 mm wide. Sepals 3, not reflexed, navicular, 5–8 × 2–3.5 mm, lanceolate-elliptic, green or tinged with reddish purple, becoming mostly reddish purple post anthesis, abaxial acute and glabrous, adaxial pair cucullate with a small apical tuft of eglandular hairs. Petals 3, pale lavender, white medio-basally, 8–11 × 7.5–9(–11) mm, broadly ovate, apically obtuse, free to the base. Stamens 6, equal, fertile, spreading; filaments white proximally, lavender and densely bearded with long, white moniliform hairs, 2–3 mm, distally; anthers basifixed, reniform; connective deltate; anther sacs small and distal, dehiscing downward; pollen bright yellow. Ovary ovoid, white, densely puberulous apically; style irregularly bent distally, lavender but white in proximal third and just below the stigma; stigma white, capitate. Capsule ca. 5 mm, oblong-ellipsoid, dehiscent. Seeds dark gray to black, coarsely 12-ribbed radially, whitish gray in depressions, narrowly trigonal, 2–3.3 mm long, 1.2–1.5 mm wide, 1 mm thick; hilum linear; embryotega dorsal.

Tradescantia petricola is known best from the tropical dry forest of Parque Nacional Palo Verde, Guanacaste, Costa Rica, where it is locally abundant in the forest understory on low limestone hills. It grows in tight crevices on vertical rock ledges and large boulders, hence the epithet. It is to be expected in adjacent areas with similar vegetation and geology, such as Parque Nacional Barra Honda. Three collections from Venezuela are also tentatively placed here.

Tradescantia petricola (Costa Rica, Venezuela) is notable in its essentially glabrous stem, pedicels, and sepals, though the sepals (5–8 × 2–3.5 mm)

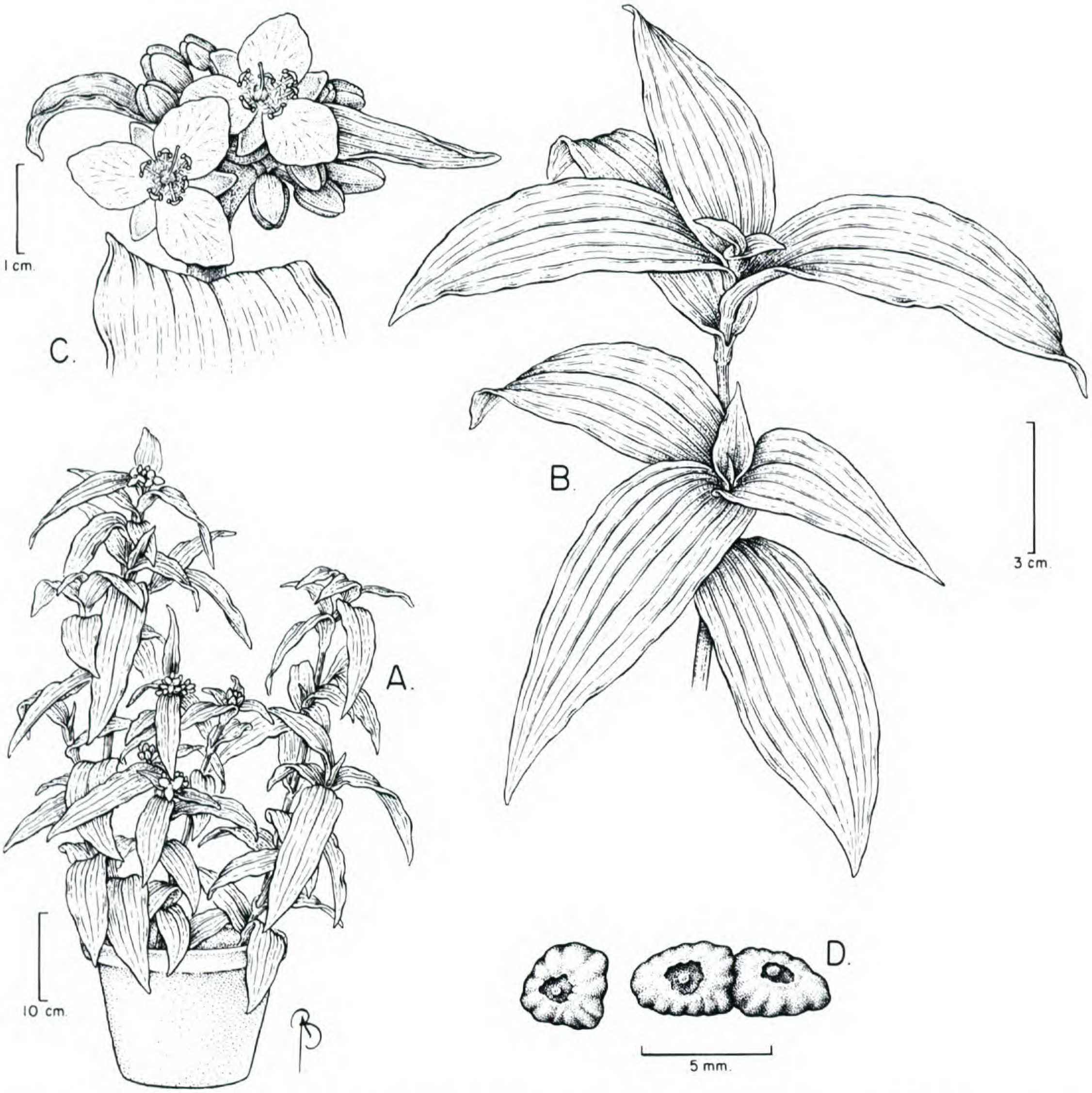

Figure 2. *Tradescantia petricola* J. R. Grant. —A. Habit. —B. Upper stems before flowering. —C. Inflorescence. —D. Seeds. (A–D *Grant & Rundell 95-02347* in cultivation.)

often have an apical tuft of eglandular hairs. Its seeds are robustly ribbed, 2–3.3 × 1.2–1.5 mm, and are dark gray to blackish. Both *T. velutina* (Guatemala, Honduras, Nicaragua) and *T. ambigua* (northeastern Brazil) have pilose inflorescences. *T. velutina* has shorter sepals (2.5–4.5 mm long) that are velutinous to short tomentose, and tan, 1–2 × 1 mm seeds. *T. ambigua* has pilose sepals, 8(–9) mm long.

In Costa Rica, *Tradescantia petricola* flowers in the rainy season from late September to November. Flowering begins with the appearance of a cincinnus in the axis of each of the upper 5 to 6 leaves; however, no paired bracts are yet visible. As the inflorescences grow, they become increasingly more complex. While most inflorescences are subtended by a pair of bracts typical of the genus, some have only a single bract, or rarely, none at all. In maturity, each inflorescence may consist of complex clusters of up to 5 or more inflorescences with single or paired bracts on short axillary shoots.

Paratypes. COSTA RICA. **Guanacaste**: Parque Nacional Palo Verde, Area Conservación Tempisque, Estación Palo Verde, Sendero Cactus, 10°20′00″N, 85°21′10″W, 10–100 m, 12 Dec. 1990, *Chavarría 195* (INB), 27 May 1995, *Grant & Rundell 95–02347* (CR, US). VENEZUELA. **Falcón**: 4 km SSW of Mene de Mauroa (ca. 4 km from border with Zulia State), Distrito Mauroa, 100 m, 1/9 1984, *Wingfield 13005* (US). **Lara**: Agua Blanca, cerca de Barquisimeto, 1930, *H. C. 126* (VEN);

Largo de Valencia, Isla el Horno, 18 Sep. 1952, *Var. & Gessner 1875* (VEN).

Acknowledgments. I thank the staffs of the following herbaria for assistance during my visits to examine material: COL, CR, G, GH, INB, MO, NY, P, R, RB, US, and VEN, and for the loan of herbarium specimens from CR, INB, PR, and VEN. Barry Hammel and Michael Grayum provided much support and encouragement for my research on *Dichorisandra.* Barry Hammel, Robert Faden, and two anonymous reviewers meticulously edited the manuscript. Bobbi Angell skillfully prepared the line drawings of both *Dichorisandra amabilis* and *Tradescantia petricola.* I especially thank Robert Faden for sharing his wealth of knowledge on the Commelinaceae.

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Typification and New Combinations in *Abrus* Adanson (Fabaceae, Faboideae, Abreae)

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Abstract. A lectotype is indicated for *Abrus melanospermus* Hasskarl. Two new combinations are provided for widely distributed taxa of *Abrus* occurring in Central, West, and East Africa, Bolivia, Brazil, Venezuela, and New Caledonia. These nomenclatural clarifications are necessary antecedents for the consideration of this genus for *Flora Zambesiaca*.

During the preparation of the treatment of Abreae (Fabaceae, Faboideae) for *Flora Zambesiaca*, taking into account the flora of Caprivi Strip, Botswana, Malawi, Zambia, and Zimbabwe, it became clear that the designation of a lectotype for *Abrus melanospermus* Hasskarl was needed. The following new combinations are needed to treat the taxa of *Abrus* within the Flora region in accordance with current nomenclatural rules.

Abrus melanospermus Hasskarl, Cat. hort. bot. bogor: 282. 1844. TYPE: Java. *Horsfield L. 14* (lectotype, designated here, K; isolectotype, K).

Abrus pulchellus Wallich ex Thwaites, Enum. pl. zeyl: 91. 1859. Syn. nov. TYPE: Sri Lanka. Belanger, *Thwaites 1467* (isotypes, G, K, P).

There is no precedent established for designating types of taxa described by Hasskarl (1844). Here, numerous protologues of new species were published from cultivated material without a specimen reference, including the protologue of *Abrus melanospermus*. Two specimens at K comprise original material as defined by Article 9.7 footnote 1 of the *International Code of Botanical Nomenclature* (Greuter et al., 1994: 11), since it can be shown that the description validating the name was based upon this material.

At K there is one specimen with a handwritten label marked "Herb. Javanicum Dr. Horsfield, L. 14" and a determination, "*Abrus melanospermus* Hassk." believed to have been penned by Hasskarl that has no conflict with the protologue for *A. melanospermus* cited above. This specimen with a young inflorescence I designate as the lectotype. Another specimen at K with a printed label indicating, "Herb. T. Horsfield, Java, Purchased 1859," then handwritten "L. 14, *Abrus melanospermus* Hassk. (M)," is from the same collection. This is also consistent with the protologue, but it lacks flowers and fruit and is here considered an isolectotype.

Based on this lectotypification of *A. melanospermus*, the following new combinations are needed for infraspecific taxa of *Abrus* occurring in the *Flora Zambesiaca* region.

Abrus melanospermus subsp. **suffruticosus** (Boutique) D. Harder, comb. nov. Basionym: *Abrus suffruticosus* Boutique, Bull. Jard. Bot. État 25: 127. 1955. *Abrus pulchellus* subsp. *suffruticosus* (Boutique) Verdcourt, Kew Bull. 24: 249. 1970. TYPE: Democratic Republic of Congo. Lubumbashi [Elisabethville], *de Giorgi s.n.* (holotype, BR).

Abrus melanospermus subsp. **tenuiflorus** (Bentham) D. Harder, comb. nov. Basionym: *Abrus tenuiflorus* Bentham, in Martius, Fl. bras. 15(1): 216. 1859. *Abrus pulchellus* subsp. *tenuiflorus* (Bentham) Verdcourt, Kew Bull. 24: 250. 1970. TYPE: Brazil. Santarem, *Spruce 786* (holotype, K; isotypes, BM, C, G, NY).

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Amorphophallus zengianus (Araceae), a New Chinese Species from Yunnan

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ABSTRACT. *Amorphophallus zengianus* C. L. Long & H. Li from Yunnan, China, is described as new. It is similar to *A. krausei* Engler in having an erect, boat-shaped spathe with a sterile portion between male and female parts, but differs in having a spathe without spots, an appendix shorter than the spathe, and a pleasant odor.

Amorphophallus zengianus C. L. Long & H. Li, sp. nov. TYPE: China. Yunnan: Jinping Xian, Ma'andi (22°40′N, 103°10′E), 900 m, 25 June 1998, *C. L. Long 98003* (holotype, KUN).

Species *Amorphophallo krausei* Engler affinis, sed spatha intus basi atro-purpurea, appendice spadicis subcylindrica 6 cm longa, 2–2.4 cm crassa papillosa et basi rugosa, inflorescentia neutra inter inflorescentias femineas et masculas 2 cm longa, 2.5 cm crassa staminodiis fusiformibus usque 6 mm longis 5 mm crassis suffulta, differt.

Tuberous herbs; tuber obovoid or depressed-obconical, ca. 14 × 12 cm, producing short globose offsets. Leaf unknown. Inflorescence long-pedunculate; peduncle ca. 56 × 1.5–2.3 cm, pale green with sparse (denser at base), blackish green, oblong, small spots, smooth; spathe erect, boat-shaped to ovate, ca. 20 × 15 cm; basal part dark purple, convolute, ca. 9.5 × 3(at base)–6 cm, slightly papillose; limb light green abaxially, green adaxially, deltoid, ca. 10 × 10 cm, the apex erect, acute. Spadix sessile, shorter than spathe, ca. 14 cm, emitting a faint, orange-like fragrance; female portion ca. 2.5 × 2 cm, the ovaries green, ovoid, ca. 2.5 mm diam., 2-ovulate; style pale green, ca. 1.5 mm, the stigma brown, slightly 3- or 4-lobed; sterile portion of spadix yellow, ca. 2 × 2.5 cm, the staminodes fusiform, ca. 6 × 5 mm; male portion of spadix yellow, ca. 3.5 cm × 2.2 mm, the synandria obconical, ca. 1 mm; anthers subglobose, short, pores apical; appendix of spadix deep yellow, cylindric, ca. 5.5 × 2.2 cm, the base rugulose, the apex acute, entirely papillose. Chromosome number: $2n = 26$.

Distribution. Known only from Jinping Xian, southern Yunnan, China, in secondary forest and shrubs in valleys, from 760 to 1820 m above sea level.

Amorphophallus zengianus resembles *A. krausei* (from western Yunnan, China, and northern Myanmar). However, the latter species differs in its inflorescence, the odor of which is most unpleasant and reminiscent of a natural gas leak; its spathe, which is pale yellowish green adaxially, the base pale green with many small, slightly elongate or irregularly ridge-shaped warts; its spadix, which is nearly as long as the spathe; and its peduncle, which is marked with partly or almost entirely confluent spots and white dots.

Morphologically, *Amorphophallus zengianus*, *A. krausei*, and other species such as *A. konjac* C. Koch, *A. yunnanensis* Engler, and *A. kachinensis* Engler & Gehrmann belong to the same section, i.e., section *Conophallus* Engler. They also have the same chromosome numbers, i.e., $2n = 26$, differing from *A. paeoniifolius* Nicolson in section *Cundarum* Engler, which has $2n = 28$ (Long et al., 1989; Li et al., 1990). Chromosome number is not significant to identify species from the same section, but it may be useful to differ sections in *Amorphophallus*.

The new species is named in honor of Zeng Xiaolian, a botanical illustrator and artist at Kunming Institute of Botany, Chinese Academy of Sciences, for his great contributions to the research of Araceae and other taxa in China.

Acknowledgments. The study is supported by the Chinese Academy of Sciences (the Knowledge Innovation Project and a grant numbered KZ951-A1-104). We are grateful to Zhou Yi-lan, who is cultivating the type collection in her private garden. Special thanks are extended to Zhou Qi-xing for making the chromosome count, and to Wang Ling for preparing the illustration. We also thank Nick Turland (MO) for his comments and help in

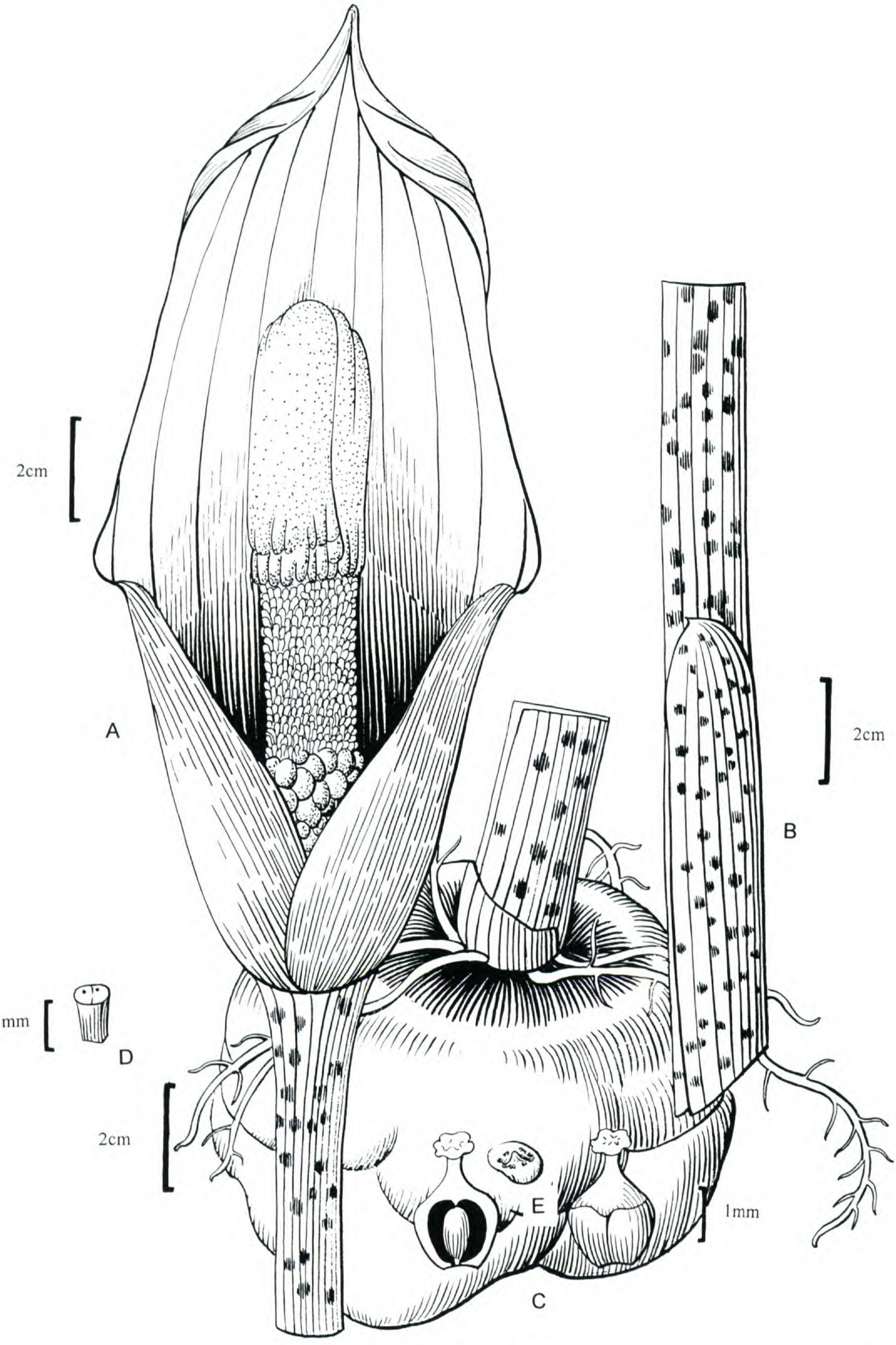

Figure 1. *Amorphophallus zengianus* C. L. Long & H. Li. —A. Inflorescence. —B. Part of peduncle showing cataphyll. —C. Tuber. —D. Synandrium. —E. Pistil and longitudinal section of pistil showing ovules. All drawn from the type collection, *C. L. Long 98003* (drawn by Wang Ling).

the preparation of the manuscript, and Thomas Croat (MO) for his valuable comments.

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Marsdenia gallardoae (Asclepiadaceae), una Nueva Especie de Chiapas y Oaxaca, México

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RESUMEN. *Marsdenia gallardoae*, una nueva especie de Asclepiadaceae de Chiapas y Oaxaca del sur de México, se caracteriza por tener el interior de la corola densamente puberulenta y por no presentar un callo en los senos de la misma. Comparte con *M. trivirgulata* Bartlett características foliares y el color de la flor.

ABSTRACT. *Marsdenia gallardoae*, a new species of Asclepiadaceae from Chiapas and Oaxaca in southern Mexico, is characterized by a densely puberulent corolla interior and absence of a callus in the sinus within the corolla. It shares with *M. trivirgulata* Bartlett foliar characteristics and the color of the flower.

En la determinación de colectas recientes de Asclepiadaceae, como parte del estudio de la flórula en la región de Nizanda en el Itsmo de Tehuantepec del estado de Oaxaca, México, que realiza el laboratorio de Ecología de la Facultad de Ciencias de la Universidad Nacional Autónoma de México (UNAM), se descubrio una nueva especie. Esta especie que a continuación se describe e ilustra, se caracteriza por ser densamente puberulenta en el interior de la corola y por no presentar un callo en los senos de la misma, entre otros caracteres distintivos.

Marsdenia gallardoae Lozada-Pérez, sp. nov.
TIPO: México. Oaxaca: Distrito Juchitán de Zaragoza, Municipio Asunción Ixtaltepec, hacia el "Agua Tibia", a 0.5 km al N de Nizanda, 16°40′02″N, 95°00′35″W, bosque ripario, 215 m, 1 ago. 1995, *C. Gallardo 1561* (holótipo, MEXU; isótipo, MO). Figura 1.

Haec species *Marsdeniae trivirgulatae* Bartlett affinis sed ab ea corolla adaxialiter dense puberula ad sinum inter lobulos callis absentibus, lobulis coronae 0.7–0.9 mm longis, 0.7–0.8 mm latis; polliniis 0.30–0.32 mm longis, corpusculo ca. 0.12 mm longo recto differt.

Trepadora con savia lechosa, tallos leñosos y suberosos en la base, glabros, ramas jóvenes glabras o retrorso-puberulentas, el indumento dispuesto en una línea. Hojas opuestas; láminas 3–6 × 1.0–3.5 cm, ovadas, lanceoladas o elípticas, ápice acuminado o agudo, margenes enteros, base aguda, obtusa o redondeada, venación pinnada, con 4–5 pares de venas laterales, haz verde, glabro, esparcidamente puberulento, o con indumento sólo en la vena central, 2–4 glándulas en la base de la lámina, envés verde pálido, glabro o puberulento, principalmente en la vena central; pecíolos 0.3–0.8 cm de largo, puberulentos. Flores 2–5, dispuestas en una cima umbeliforme lateral, 0.7–1.0 cm de largo, sésil o con pedúnculos ca. 1.0 mm de largo, puberulentos o glabros; brácteas 1.2–1.5 × 0.4–0.5 mm, ovadas a estrechamente ovadas; pedicelos 1–2 mm de largo, puberulentos. Cáliz del mismo tamaño que el tubo de la corola, lóbulos 1.7–2.2 × 0.8–1.2 mm, lanceolados a estrechamente ovados, glabros o puberulentos abaxialmente, ciliados en el margen, con una glándula en cada seno; corola blanca o blanca con líneas rojas, campanulada, 5–7 mm de largo, tubo 1.7–2.2 mm de largo, lóbulos 2.3–3.5 × 1.0–1.8 mm, lanceolados a estrechamente ovados, ápice obtuso a agudo, oblicuamente emarginado, glabros abaxialmente o con algunos pelos cortos, densamente puberulentos adaxialmente, incluyendo el tubo. Ginostegio ligeramente cónico, corto-estipitado, 1.3–1.5 mm de largo (sin incluir el apéndice estilar); corona de 5 lóbulos, unidos a la base del ginostegio, cada lóbulo 0.7–0.9 × 0.7–0.8 mm, muy ampliamente ovado, tan altos como las anteras, lóbulos laterales amplios, cubriendo la cavidad estigmática; apéndice de la antera membranoso, caudado, margen crenado, un tercio o casi la mitad de la longitud del apéndice estilar; polínios 0.30–0.32 × ca. 0.1 mm, corpúsculo ca. 0.12 mm de largo, recto; apéndice estilar cónico, rostrado, 1.0–1.5 × ca. 0.4 mm, ápice agudo, ligeramente dividido. Folículos napiformes, ápice largo-atenuado, 9.0–10.5 × ca. 1.0 cm, glabro. Semillas 0.8–1.0 × 0.5–0.6 cm, ovadas, con un margen engrosado de color blanco, superficie interior lisa, de color verde claro, con una cara convexa y la opuesta concava, esta última con una cresta que se extiende desde el ápice hasta el centro; coma ca. 3.5 cm de largo.

Marsdenia gallardoae comparte con *M. trivirgulata* características de forma, tamaño, color e in-

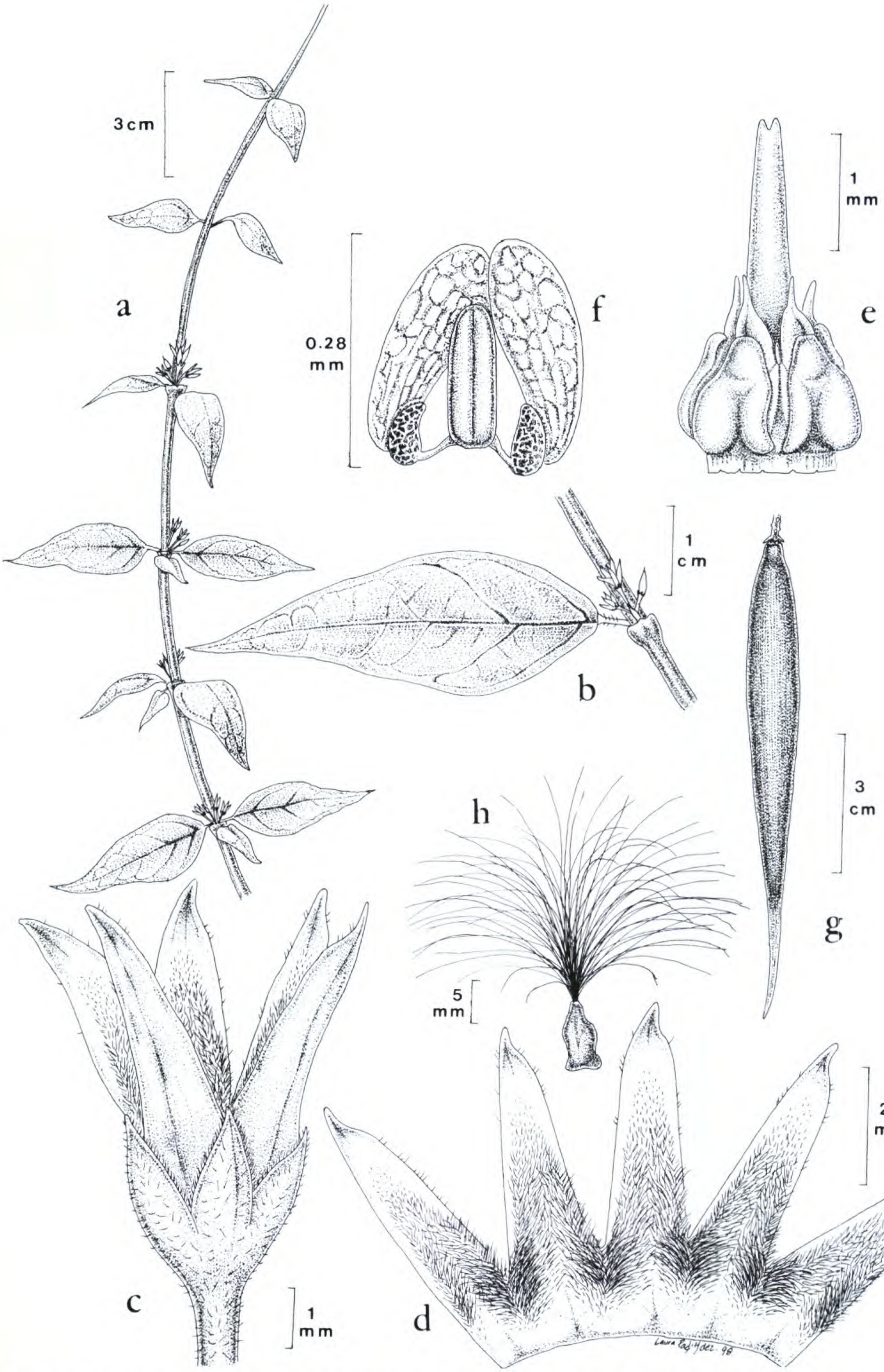

Figura 1. *Marsdenia gallardoae* Lozada-Pérez. —a. Hábito mostrando el arreglo de las flores y hojas. —b. Detalle de la hoja y la inflorescencia. —c. Flor mostrando la pubescencia en la cara adaxial de la corola. —d. Vista adaxial de la corola. —e. Ginostegio mostrando los lóbulos de la corona y el apéndice estilar. —f. Polinario. —g. Fruto. —h. Semilla. (a–f, *C. Gallardo 1561*; g, h, *E. Pérez 1647*).

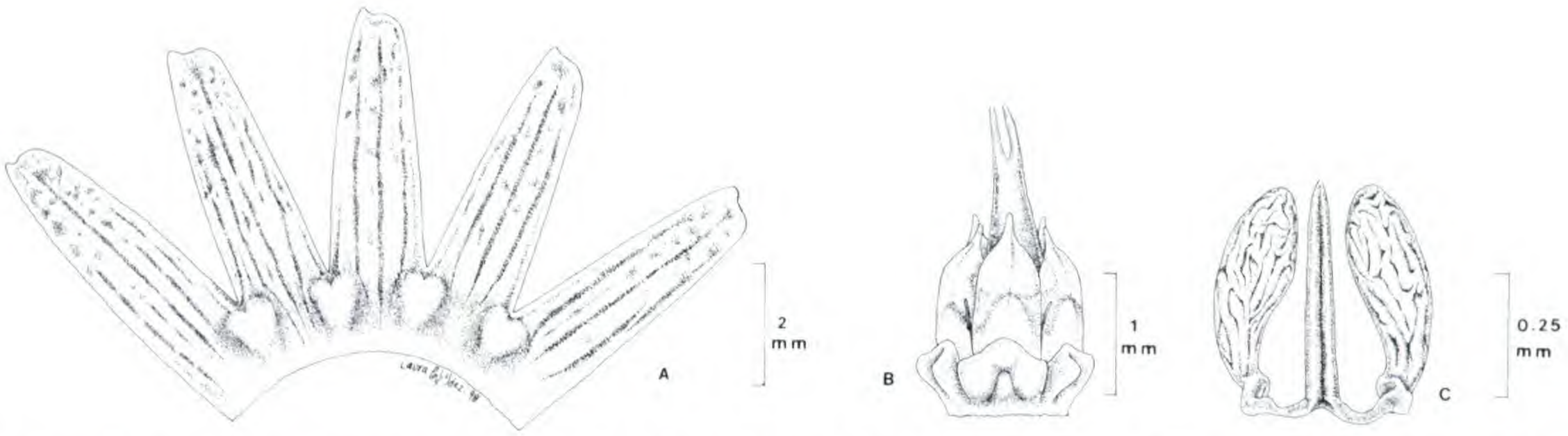

Figura 2. *Marsdenia trivirgulata* Bartlett. —A. Vista adaxial de la corola, las manchas en los lóbulos corresponden a la coloración vino o rojo pálido. —B. Ginostegio mostrando los lóbulos de la corona y el apéndice estilar. —C. Polinario (*C. Gallardo 258*, FCME).

dumento de las hojas; el tipo de inflorescencia también es similar, pero *M. gallardoae* tiene de 2 a 5 flores por inflorescencia, a diferencia de *M. trivirgulata* que tiene ca. 8 flores. Aunque las etiquetas de herbario mencionan que los especímenes de ambas especies al momento de ser colectados en el campo presentan corolas de color blanco con líneas y manchas rojas, tal coloración no se mantiene en los ejemplares de herbario. Sin embargo, *M. gallardoae* se reconoce por tener flores de color muy pálido, en cambio, las flores de *M. trivirgulata* conservan tonos de color vino o rojo pálido. Otros caracteres de la corola igualmente útiles para diferenciar a estas especies son el indumento y la presencia o ausencia de un callo en el seno de los lóbulos de la corola; *M. gallardoae* es densamente puberulenta en el interior de la corola y carece de un callo en el seno de los lóbulos, en cambio, la corola de *M. trivirgulata* (Fig. 2) carece de indumento en su interior (los ejemplares examinados de México son glabros, sin embargo, algunos especímenes de Nicaragua presentan indumento, pero este es muy esparcido y más largo) y presenta un callo en cada seno. Los caracteres del ginostegio también presentan diferencias importantes entre las dos especies; ambas presentan un apéndice estilar muy largo y bífido en el ápice, pero en *M. trivirgulata* la división apical del apéndice estilar es más largo que en *M. gallardoae*; esta última especie tiene lóbulos de la corona casi tan largos como anchos que alcanzan el ápice de las anteras; el corpúsculo es recto y corto con respecto a los polinios y en *M. trivirgulata* los lóbulos de la corona son más anchos que largos y generalmente alcanzan sólo la base de las anteras; el corpúsculo es virguliforme y casi tan largo como los polinios.

Marsdenia gallardoae se conoce solamente de los estados de Oaxaca y Chiapas, México; en cambio *M. trivirgulata* es de más amplia distribución, ya que se encuentra desde Sonora, México, hasta Panamá en la llanura costera del Océano Pacífico. Ambas especies tienen como habitat los bosques tropicales deciduos y la vegetación cercana a los ríos en suelos de origen calizo, desde el nivel del mar hasta los 750 m de altitud. *Marsdenia gallardoae* florece de julio a septiembre y fructifica de septiembre a noviembre; *M. trivirgulata* florece de septiembre a noviembre y no se conoce cuando fructifica.

El epiteto específico honra a Claudia Gallardo-Hernández, botánica de la Facultad de Ciencias de la Universidad Nacional Autónoma de México, por su contribución al conocimiento de la flora de La Chinantla y Nizanda, Oaxaca.

Paratipos. MÉXICO. **Chiapas:** Mpio. Frontera Comalapa, a lo largo de la carretera 190, 28 km al N de El Jocote (empalme), a 37 km de La Trinitaria, 650 m, 19 sep. 1988, *W. D. Stevens & E. Martínez 25739* (MEXU); Mpio. Comitán de Domínguez, 16 km al SW de Tzimol, 1.5 km al SW de la bifurcación de la carretera, 740 m, 20 sep. 1988, *W. D. Stevens & E. Martínez 25805* (MEXU). **Oaxaca:** Distrito Juchitán de Zaragoza, Mpio. Asunción Ixtaltepec, 3 km al S de Nizanda, cerca de la vía del tren Transísmico, 16°38′08″N, 95°00′40″W, 200 m, 20 dic. 1998, *E. Pérez 1647* (MEXU), 14 sep. 1998, *E. Pérez & B. Reyes 1504* (MEXU); Mpio. Ciudad Ixtepec, Ixtepec, 25 jul. 1936, *E. Matuda 916* (MEXU); Distrito Santo Domingo Tehuantepec, Mpio. Salina Cruz, 4 km al S de Salina Cruz, carretera a Playa la Ventosa, 27 jul. 1984, *R. Torres & C. Martínez 5680 bis* (MEXU); Mpio. Santiago Laollaga, 15 km al N de Laollaga, 300 m, 23 ago. 1984, *R. Torres & C. Martínez 5852* (MEXU); Mpio. San Mateo del Mar, Huazantlán del Río, carretera Huilotepec–Huazantlán, 1 km antes de Huazantlán, 5 m, 12 ago. 1978, *D. Zizumbo & P. Colunga 286* (MEXU); Mpio. Santa María Mixtequilla, a 18 km de Mixtequilla, carretera a Paso Escondido, 16°27′N, 95°19′W, 300 m, 24 sep. 1994, *I. Calzada 19268* (MEXU); Mpio. Santo Domingo Tehuantepec, El Limón, 17 km al W de Tehuantepec, entrando por Yerba Santa, 19 ago. 1985, *C. Martínez 110* (MEXU); Arroyo Yerba Santa, a 2 km de la carretera Tehuantepec–Oaxaca, 16°21′N, 95°22′W, 10 ago. 1988, *C. Martínez 1670* (MEXU); 4.6 km al NW de Aguascalientes,

camino a Santa Clara, Salina Cruz, 180 m, 1 sep. 1986, *R. Torres & C. Martínez 8924* (MEXU).

Agradecimientos. A José Luis Villaseñor Ríos por la diagnosis en latín, la revisión del manuscrito y sus valiosas observaciones y comentarios. A Jorge Meave del Castillo y Eduardo Pérez responsables del proyecto Flórula de Nizanda. La ilustración fue realizada por Laura Padilla H.

New Combinations in *Trichophorum*, *Scirpoides*, and *Ficinia* (Cyperaceae)

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ABSTRACT. Recent DNA studies support the recognition of four new combinations for species originally assigned to *Scirpus*. *Trichophorum rigidum* has a single pseudolateral spikelet and lacks perianth segments. *Scirpoides burkei* has a woody rhizome, compact globose inflorescences, and spirally arranged glumes and lacks perianth segments. *Ficinia trollii* is a robust species lacking perianth segments. *Ficinia nodosa* has a woody rhizome and a gynophore.

The genus *Scirpus* L. (Cyperaceae) is generally accepted as being split into several segregate genera on the basis of gross and embryo morphology (Bruhl, 1995; Goetghebeur, 1998). However, the placement of several species originally assigned to *Scirpus* has been uncertain due to conflicting morphological characters. Recent studies of chloroplast DNA in Cyperaceae, focusing on parsimony analysis of sequence data obtained from the *rbc*L gene and the *trn*L-F non-coding region, have now clarified the placement of these taxa (Muasya et al., 1998; Muasya et al., submitted). The following combinations are made to place the species into appropriate genera and maintain these genera as monophyletic.

Trichophorum rigidum (Steudel) Goetghebeur, Muasya & D. A. Simpson, comb. nov. Basionym: *Isolepis rigida* Steudel ex Lechler, Berberid. Amer. Austr. 56. 1857. *Scirpus rigidus* (Steudel) Böckeler, Linnaea 36: 492. 1870. *Baeothryon rigidum* (Steudel) Sojak, in Cas. Nar. Muz. (Prague), 148: 193 (1979 publ. 1980). TYPE: Peru. *Lechler 2064* (holotype, B; isotype, K).

Distribution. Bolivia, Ecuador, Peru. Paramo; 3700–4400 m.

This species was first described in *Isolepis* but was subsequently transferred to *Scirpus*. Böckeler (1870) adopted a broad circumscription of the latter and included plants with characters such as a single pseudolateral spikelet and the absence of perianth segments. However, these are not consistent with *Scirpus* as currently circumscribed (branched inflorescence with many spikelets and the presence of perianth segments). Although the plant superficially resembles *Isolepis* in having rather small spikelets, its placement in this genus was carried out at a time when this genus was poorly circumscribed. We consider it to be morphologically closer to *Trichophorum* in having erect leaves and a single spikelet. Analysis of molecular data (Muasya et al., 1998; Muasya et al., submitted) makes this taxon sister to *Trichophorum cespitosum* (L.) Hartman, thus supporting our morphological interpretation.

Scirpoides burkei (C. B. Clarke) Goetghebeur ex Goetghebeur, Muasya & D. A. Simpson, comb. nov. Basionym: *Scirpus burkei* C. B. Clarke ex C. B. Clarke, in Thiselton-Dyer, Flora Cap. 7: 227. 1898. TYPE: South Africa. *Burke 231* (lectotype, here selected, K).

Distribution. South Africa. Seasonal wetlands; 1000–2500 m.

This species has some characteristics of *Scirpus* as currently circumscribed, in particular the branched inflorescence with numerous spikelets. However, several other characters place it in *Scirpoides*, such as the woody rhizome, compact globose inflorescences, spikelets with spirally arranged glumes, and the absence of perianth segments. The new combination, *Scirpodes burkei*, was provisionally made by Goetghebeur (1986) based on morphological data. DNA analyses (Muasya et al., 1998; Muasya et al., submitted) make the taxon sister to *Scirpoides holoschoenus*, thus supporting its placement in *Scirpoides*. *Scirpoides burkei* is distinguished from other members of the genus by the

well-developed leaf blades and mucronate glumes with broad-hyaline margins.

Scirpus schinzianus, cited by Clarke (1894) in synonymy, is a manuscript name from two collections (*Rehman 4694, 6889*, not located) and was never validly published. Despite the orthographic similarity it is not connected with *Scirpus schinzii* Böckeler, which is a synonym of *Scirpoides dioecius* (Kunth) J. Browning. The lectotypification proposed here avoids possible confusion associated with these names.

Ficinia trollii (Kükenthal) Muasya & D. A. Simpson, comb. nov. Basionym: *Scirpus trollii* Kükenthal, Feddes Repert. 53: 72. 1944. *Isolepis trollii* (Kükenthal) K. Lye, in Lye & Haines, Bot. Not. 130: 313. 1977. TYPE: Tanzania. *Troll 4916* (holotype, B).

Distribution. Mozambique, Tanzania, and Zimbabwe. Alpine grassland on broken quartzite rocks; 1600–2400 m.

Although first described as a member of *Scirpus* s.l., Lye in Lye and Haines (1977) transferred this species to *Isolepis* without any comment. Haines and Lye (1983) supported this placment and based it on the shared absence of a gynophore. They also suggested that it is "possibly more closely related to the genus *Ficinia* . . . than to other species of *Isolepis*," being a robust plant with "a tussocky, almost woody base . . . unlike that of any other (*Isolepis*) species" (Haines & Lye, 1983: 140). DNA studies (Muasya et al., submitted) support the latter, with *F. trollii* embedded in a clade comprising *Ficinia* species. We therefore consider it appropriate to place the species in *Ficinia*, although a revision of this genus is highly desirable in order to establish generic limits and review the characters that distinguish the group.

Ficinia trollii is diagnosed by the woody rhizome, leaves with scabrid margins, terete spikelets, flowers lacking perianth segments, and smooth, shiny nutlets.

Ficinia nodosa (Rottböll) Goetghebeur, Muasya & D. A. Simpson, comb. nov. Basionym: *Scirpus nodosus* Rottböll, Descr. Pl. Rar. 24. 1772. *Isolepis nodosa* (Rottböll) R. Brown, Prodr. 221. 1810. *Holoschoenus nodosus* (Rottböll) A. Dietrich, Sp. Pl. 2: 165. 1833. *Scirpoides nodosus* (Rottböll) Soják, Cas. Nár. Mus., Odd. Prir. 141: 62. 1972. TYPE: South Africa. *Koenig s.n.* (holotype, C).

Isolepis monocephala Steudel, Syn. Cyp. 97. 1855. Syn. nov. TYPE: Chile. *D'Urville 185* (holotype, P).

Scirpus nodosus Rottböll var. *macrostachyus* Bentham, Fl. Austral. 7: 331. 1878. Syn. nov. TYPE: Australia. *Oldfield s.n.* (holotype, K).

Distribution. Widespread in the Southern Hemisphere, including Australia, Chile, New Zealand, South Africa, St. Helena, and St. Paul. Coastal sand dunes, stream sides; 0–1500 m.

Ficinia nodosa has often been treated as a member of *Scirpus* (e.g., Gordon-Gray, 1995) or *Isolepis* (e.g., Wilson 1981, 1994) even though it has characters typical of *Ficinia*, such as the woody rhizome and presence of a gynophore. The main justification for this lies in its distribution pattern. *Ficinia* has traditionally been considered as occurring only in sub-Saharan Africa, whereas *Scirpus* and *Isolepis* are widespread. *Ficinia nodosa* is widespread in the Southern Hemisphere, and its inclusion in *Ficinia* markedly extends the distribution of this genus. DNA analyses (Muasya et al., 1998; Muasya et al., submitted) place the species within a *Ficinia* clade that, together with the morphological characters indicated above, make its placement in *Ficinia* appropriate.

Acknowledgments. We thank the curators of B, C, K, and P for access to or loan of specimens. The first author acknowledges receipt of a Ph.D. studentship from the Royal Botanic Gardens Kew, during the tenure of which this work was carried out.

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New Species of *Siparuna* (Siparunaceae) III. Three New Species and One Newly Ranked Entity from Colombia, Ecuador, and Peru

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ABSTRACT. Three new species of *Siparuna* (Siparunaceae) are described, illustrated, and placed in a phylogenetic context: *S. gentryana* from western Ecuador and adjacent Colombia, *S. lozaniana* from the western Andes in Colombia, and *S. vasqueziana* from Amazonian Peru. In addition, *Siparuna calantha* from the Sierra Nevada de Santa Marta, originally described by Janet Perkins as a variety of a Mexican entity, is raised to species rank because its broader leaves and more numerous carpels readily distinguish it from its apparent closest relative, a species from the western Colombian Andes. Each of the species is known from several collections, which allowed the secure matching of sexual morphs in the three that are dioecious.

Visits by the first author to major Colombian herbaria (COAH, COL, CUVC, HUA, JAUM, MEDEL, TULV, UDBC, and VALLE) in 1997 and 1999 brought to light abundant material of several previously undescribed species of *Siparuna*, a genus that we are monographing (Renner & Hausner, 1995, 1996, 1997). Three of the species are now known from flowering and fruiting collections. However, we are still awaiting fully fruiting material of *S. vasqueziana*. *Siparuna vasqueziana* is unique in the genus in its flower size and morphology and can therefore be keyed out easily even in the absence of mature fruits.

The Siparunaceae are a distinct lineage of Laurales (Renner, 1999), the sister group of which are the Gomortegaceae from Chile (one species) and the Atherospermataceae from Chile and Australia, New Zealand, Tasmania, New Caledonia, and New Guinea (14 species). Siparunaceae are thus only distantly related to Monimiaceae sensu stricto, which are closest to Lauraceae and Hernandiaceae (Renner & Chanderbali, in press). Siparunaceae consist of *Siparuna* (including *Bracteanthus* Ducke) and its sister group *Glossocalyx*, a monotypic West African genus of dioecious straggling shrubs (Renner, unpublished obs.), very similar to *Siparuna*. *Siparuna* comprises 15 monoecious and at least 50 dioecious species. Ongoing molecular phylogenetic work in the genus (Renner & Won, in prep.) indicates that the dioecious species form a single derived clade, while the monoecious clades are more basal and form more than one clade. Of the species described here, three are dioecious, while one, *S. gentryana*, is monoecious; none have been sequenced.

Although a few papers now exist on the pollination and floral function of *Siparuna* (Feil, 1992; Renner et al., 1997), we still have considerable work ahead of us before fully understanding the evolution of Siparunaceae floral morphology and breeding systems. We would be extremely indebted to anyone who would send us liquid-preserved flowers and/or leaves dried in silica gel to be used in ongoing anatomical and phylogenetic studies. Additionally, some nine suspected new species from Panama, Colombia, Ecuador, and Peru await the collection of flowers of both sexes before they can be described, and we would be happy to supply details to botanists collecting in these countries.

Siparuna gentryana Renner, sp. nov. TYPE: Ecuador. Carchi: Tulcán, Reserva Etnica Awá, Parroquia El Chical, Centro Gualpí Medio, Río Canumbí, 1150 m, 19–28 Feb. 1993, *A. Grijalva, C. Aulestia & J. Taicuz 606* (holotype, QCNE; isotypes, AAU, MO, NY, QCA, QCNE). Figures 1, 2, and 3.

A *Siparuna cristata* (Poeppig & Endlicher) A. DC. fructibus minoribus tuberculatibusque differt.

Monoecious tree, 4–20 m tall and reaching a DBH of at least 34 cm, branchlets terete but flattened at the nodes, densely grayish brown puberulous or glabrous. Leaves opposite, the petioles 1–

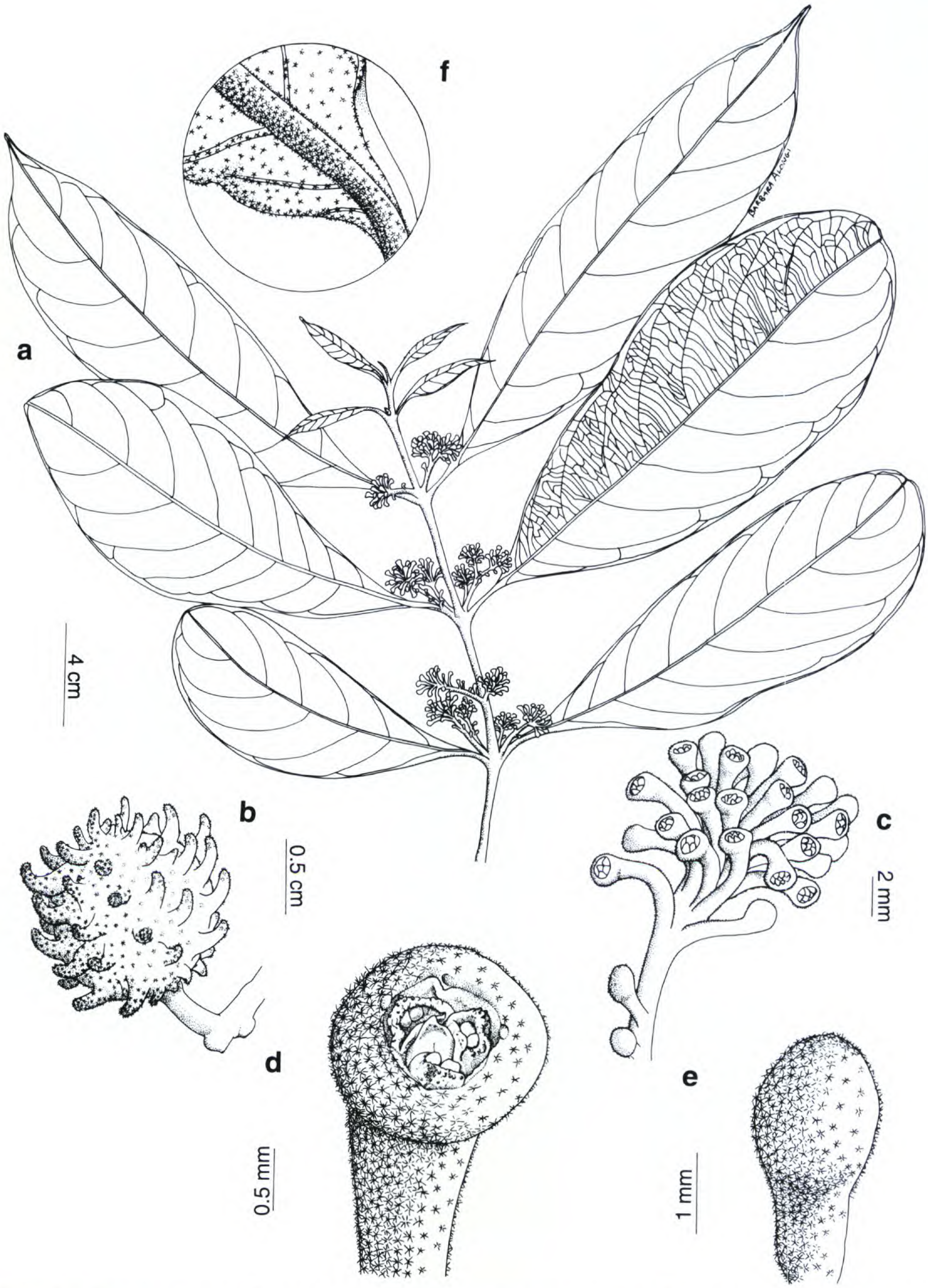

Figure 1. *Siparuna gentryana* Renner, drawn from representative paratypes. —a. Flowering specimen (*Gentry et al. 53606*, MO). —b. Fruit (*Monsalve B. 1678*, MO). —c. Inflorescence (*Tipaz 2491*, MO). —d. Male flower. —e. Bud. —f. Lower leaf surface indumentum.

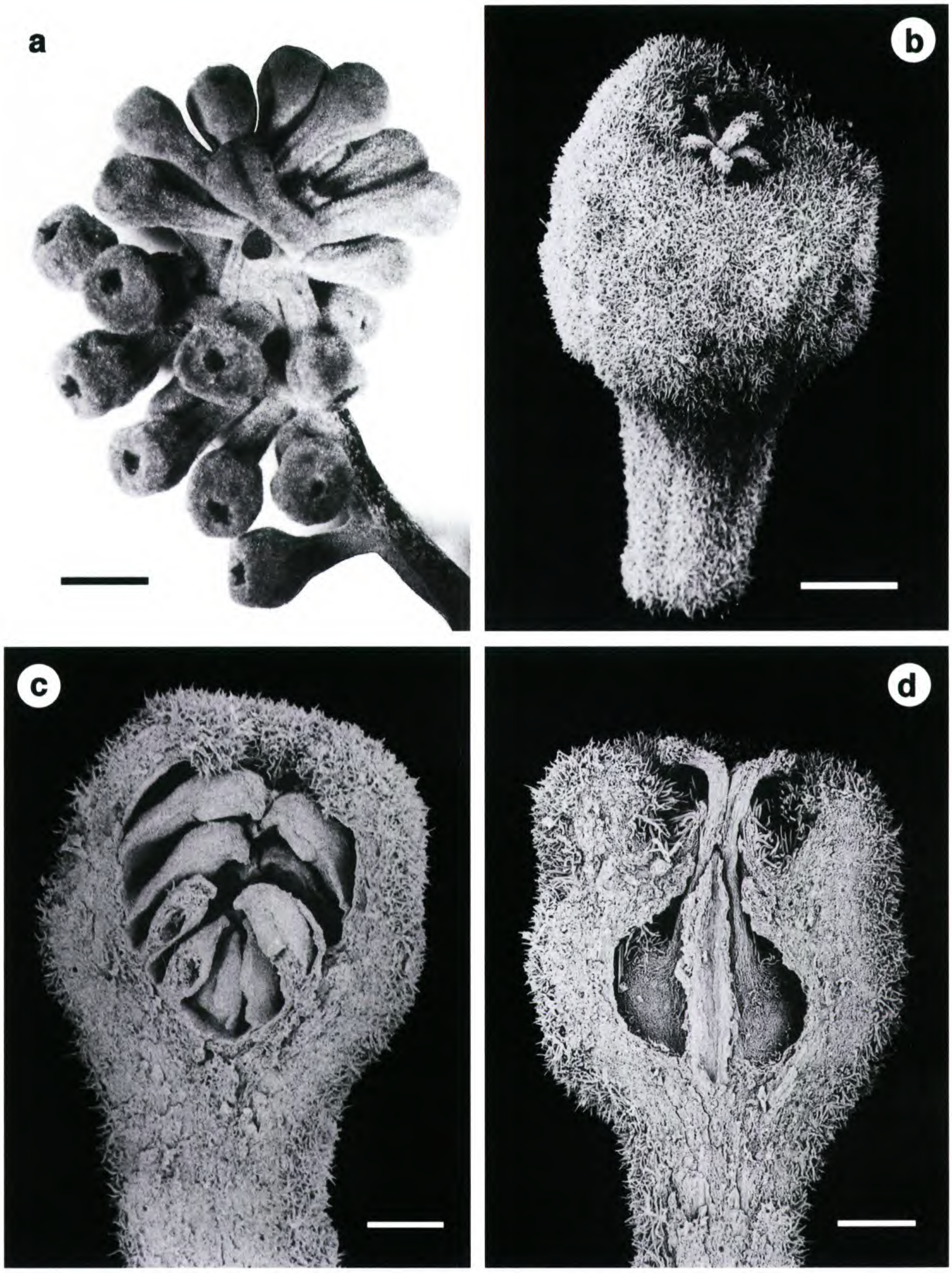

Figure 2. *Siparuna gentryana* Renner (*Grijalva et al. 606*, MO). —a. Inflorescence; female flowers on the left with exserted styles (scale bar equals 2 mm). b–d. Scanning electron micrographs. —b. Mature female flower (scale bar equals 0.5 mm). —c. Longitudinal section through a male flower, the pollen-sac valves still closed (scale bar equals 0.3 mm). —d. Longitudinal section through a female flower, showing two carpels, their styles, and the floral roof, which tightly sheaths the styles where they emerge from the flower (scale bar equals 0.3 mm).

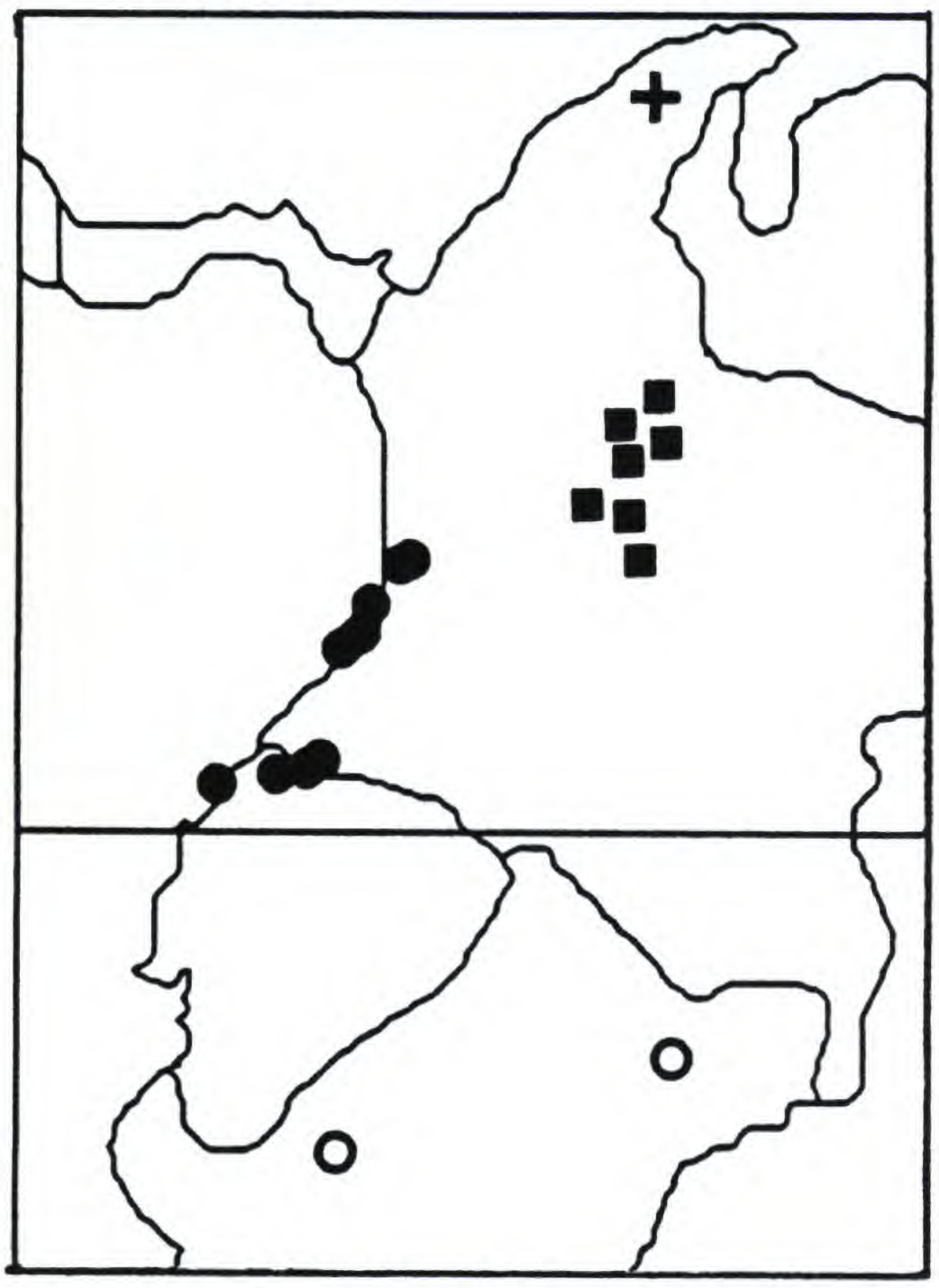

Figure 3. Distributions of *Siparuna gentryana* (closed circles), *S. calantha* (cross), *S. vasqueziana* (open circles), and *S. lozaniana* (squares) in northwestern South America.

1.8(–3) cm long, the lamina drying dark reddish brown or rarely pale green, stiff-chartaceous to leathery, oblong, 20–35(–40) × (8–)10–15 cm, the base acute to obtuse, the apex cuspidate, the tip to 1 cm long, lamina above and below glabrous except for the midrib, which may be minutely puberulous near the petiole, with 6 to 13 pairs of secondary veins, flat above, slightly raised below, the margin entire. Cymes 2–3 cm long, short-branched (Figs. 1c, 2a) and mostly borne in pairs in the leaf axils as is characteristic of the genus, with 15 to 20 flowers, the pedicels 2–4 mm long and densely puberulous. Male flowers at anthesis 1.5–2.2 mm diam., subglobose in shape, the receptacle as puberulous as the cymes, the 5 tepals fused to a thick rim, when fresh cream, the floral roof a barely visible membranous rim within the tepal rim (Figs. 1d, 2c); stamens (5)9 to 20(30). Female flowers closely resembling the male flowers except that the floral roof forms a short cylinder tightly sheathing the styles (Fig. 2b, d); styles usually 5 (Fig. 2b). Fruiting receptacle 1.5(–2) cm diam. and conspicuously tuberculate (Fig. 1b), the tubercles fleshy and up to 4 mm long; mature fruits purple or red, drying brown or black; drupelets 1 to 4.

Distribution (Fig. 3), *habitat, and phenology.* *Siparuna gentryana* occurs in western Ecuador and Colombia (primarily in the Chocó phytogeographical region) in primary forests from sea level to 1150 m. In Colombia, it has also been collected in Cauca and Valle, but not yet in Nariño where it probably occurs as well. Several sterile specimens from the department of Chocó are suspected to represent *S. gentryana*, but cannot be distinguished with confidence from *S. cristata* (see discussion below). Flowering and/or fruiting material has been collected in every month of the year.

Etymology. The species is named for the late Al Gentry who, during inventory work in the Chocó region, collected it at least nine times.

Common name. Comida de mono (Ecuador; indicating possible seed dispersal by primates).

Siparuna gentryana resembles *S. cristata* (Poeppig & Endlicher) A. DC. in leaf shape and venation, but that species has smooth fruits that reach 3.5–4 cm in length, whereas *S. gentryana* fruits are tuberculate or spiny and only half that size. In *S. cristata*, pedicels of the male flowers often elongate during flowering, becoming up to 2 cm long, a character not seen in *S. gentryana*, where pedicels remain relatively short. Inflorescences and young branchlets in *S. gentryana* often have a puberulous indumentum (Fig. 2a–d) that is not seen in *S. cristata*. *Siparuna cristata* occurs throughout the Amazon basin and reaches northern Venezuela, adjacent northernmost Colombia, and Panama; its range therefore overlaps with that of *S. gentryana* in the Chocó.

Paratypes. COLOMBIA. **Valle:** Bajo Calima, 20 m, 28 June 1961, *Cabrera 559* (F); Mpio. Buenaventura, Quebrada San Joaquín, 100 m, 7 May 1968, *Idrobo & Garzón 6208* (COL); ca. 15 km N of Buenaventura, 50 m, transect 9, 14 Feb. 1983, *Gentry et al. 40208* (COL, JAUM, MO), transect 9, 15 Feb. 1983, *Gentry et al. 40280* (COL, JAUM, MO), 26 Mar. 1986, *Gentry et al. 53606* (MO), ca. 20 km N of Buenaventura, 12 Apr. 1987, *Gentry et al. 56802* (CUVC, MO); Concesión Pulpapel Buenaventura, 100 m, 13 Dec. 1984, *Monsalve B. 610* (COL, JAUM, MO), 3 June 1987, *Monsalve B. 1508* (MO), 20 Aug. 1987, *Monsalve B. 1646* (MO), 1 Sep. 1987, *Monsalve B. 1678* (MO), 16 Oct. 1987, *Monsalve B. 1973* (MO), 1 Aug. 1989, *Monsalve B. 3141* (CUVC, MO), 26 May 1987, *Faber-Langendoen et al. 654* (CUVC, MO), 4 July 1987, *Faber-Langendoen 1157* (MO); Mpio. Buenaventura, Correg. Bajo Calima, Vda. San Isidro, 30 m, 17 May 1989, *Daly et al. 6019* (CUVC, HUA, MO); Costa del Pacífico, Río Micay, en Guayabal, 5 m, 25 Feb. 1943, *Cuatrecasas 14126* (F, VALLE). **Cauca:** Mpio. Guapí, Parq. Nac. de Isla Gorgona, 250 m, 16 Mar. 1975, *Cabrera R. & Rangel 3260* (CUVC), 1 June 1986, *Lozano C. & Rangel 5096* (COL); Costa del Pacífico, Río Naya, Correg. Puerto Merizalde, 15 m, 21 Feb. 1943, *Cuatrecasas 14024* (US, VALLE). ECUADOR. **Esmeraldas:** Lita to San Lorenzo, km 25, near Alto Tambo, 740 m, 19 July 1988, *Dodson & Gentry 17529* (MO, QCNE); Fila de Bilsa, 7 km E of San Jose de Bilsa, ca. 80 km due SW of Esmeraldas, 12 km

SE of El Salto on Atacames–Muisne rd., transect 1, 280 m, 28 Jan. 1991, *Gentry & Josse 72777* (MO, QCNE); Eloy Alfaro, Reserva Ecológica Cotacachi Cayapas, San Miguel, 130 m, 15 Jan. 1993, *Tipaz 2491* (AAU, MO, NY, QCNE), *Tipaz 2633* (MO, QCNE), *Tipaz 2644* (MO, QCNE).

Siparuna lozaniana Renner & Hausner, sp. nov. TYPE. Colombia. Cundinamarca: 12 km SE of Gachalá, 2440 m, female specimen, 21 Sep. 1944, *M. L. Grant 10213* (holotype, COL; isotypes, NA, NY, US, WIS). Figures 4 and 3.

A *Siparuna petiolaris* (Kunth, in Humboldt & Bonpland) A. DC. fructibus vix tuberculatibus differt.

Dioecious shrub or treelet, 1–8 (rarely to 16) m tall, young branchlets subangular or terete, subglabrous or sparsely stellate-pubescent. Leaves in whorls of 3 or opposite, the petioles 0.7–5 cm long, the lamina drying reddish brown, oblanceolate to obovate, rarely broadly elliptic, 8–14(–26.5) × 2.7–5(–11) cm, the base acute to obtuse, the apex acute to obtuse, the tip 0.5–0.8 cm long, leaves above and below with few minute appressed stellate to sublepidote hairs, occasionally glabrescent, young leaves above sometimes with conspicuous appressed silvery stellate-lepidote hairs, with 9 to 12 pairs of secondary veins, these flat above, distinctly raised below, the margin serrulate or serrate. Cymes 2.5–4 cm long and often pendent, with 10 to 15 flowers, pubescent like the young branchlets. Male floral cup at anthesis 2.0–2.9 mm diam. and 1.5–2.5 mm high, broadly obconical to semiglobose, glabrous except for a few appressed bifid or few-branched hairs, tepals 4 or 5(6), narrowly triangular to almost spatulate (Fig. 4b), 2–4 mm long, fresh greenish yellow or whitish, the floral roof distinctly raised, and glabrous; stamens 9 to 12. Female floral cup at anthesis 3.5–4 mm diam. and 3–3.5 mm high, subglobose, the pubescence as in the male flowers, the floral roof raised to a cylindrical bulge separated by a groove from an acute central tube sheathing the styles (Fig. 4f), drying dark brown; styles 2 to 5. Fruiting receptacle 1–1.5 cm diam., globose and basally usually with minute (less than 1 mm long) protuberances (Fig. 4e); when fresh and mature red with cream spots (lenticels) and a strong lemon smell; drupelets 1 to 3.

Distribution (Fig. 3), *habitat, and phenology.* *Siparuna lozaniana* is restricted to the eastern Andean cordillera in central Colombia where it appears common in the states of Santander, Boyacá, and Cundinamarca. Growing in wet montane forest, in páramo and subpáramo at 1600–3300 m elevation. Flowering and fruiting collections have been made throughout the year.

Etymology The species is named in honor of Gustavo Lozano C., curator at the Colombian National herbarium (COL) and professor at the Colombian National University, who was among the first to collect it.

Common name. Limoncillo.

Siparuna lozaniana is easily recognized among Colombian species by the combination of oblanceolate to obovate leathery leaves, pendent inflorescences with a sparse indumentum of appressed few-branched hairs, and small globose fruits. Other Colombian species that sometimes have similar leaves are *S. petiolaris* from the western Andean Cordillera and *S. calantha* (described below) from the Sierra Nevada de Santa Marta. Both differ from *S. lozaniana* in having distinctly spiny or spiny-tuberculate fruits.

Paratypes. COLOMBIA. **Boyacá:** between Sogamoso and Pajarito, km 80, 2550 m, 10 Mar. 1980, *Bernal-M. 341* (COL), 10 Mar. 1980, *Bernal-M. 376* (COL); vic. of Arcabuco, 2600 m, 29 Oct. 1963, *Espinal-T. & Montenegro-M. 1412* (COL); Mpio. Arcabuco, Vda. Peñas Blancas, Hac. Las Delicias, 2600 m, 10 Mar. 1996, *Fernández-A. et al. 14112* (COL); Arcabuco, towards sítio La Cumbre, 2300 m, 22 May 1979, *Valencia & Jeréz-F. 16* (COL); below Vadohondo, km 302, sítio La Sabana, 2000 m, 24 Feb. 1954, *Idrobo & Jaramillo-Mejía 1577* (COL); Mpio. Pajarito, Correg. de Corinto, 2200 m, 11 Oct. 1967, *Lozano C. et al. 859* (COL); entre Moniquirá and Gachantivá, 2000 m, 14 May 1996, *Rangel et al. 13238* (COL). **Cundinamarca:** Mpio. Junín, Correg. Inspecciones Chuscales, Res. Biol. Carpanta, 2500–3300 m, 27 Apr. 1988, *Luteyn et al. 12203* (F, NY); Chingaza National Park, Cordillera Oriental E of Bogotá, 2800–3000 m, 30 Oct. 1992, *Gentry & Repizzo 78067* (MO); Carpanta Biological Reserve, 20 km due W of Junín, 2400–3000 m, 1990, *Repizzo & Calle 167* (MO); Mpio. Chingaza, *Goitia 1962* (UDBC), *Goitia 1964* (UDBC). **Meta:** Mpio. El Calvario, Finca San Luís, 2250 m, 4 Mar. 1981, *Camargo-G. & Huertas-G. 7875* (COL). **Santander:** border to Boyacá, Correg. Virolín, Finca La Sierra, 2500 m, 13 May 1976, *Lozano C. et al. 2429* (COL); Mpio. Charalá, Vda. El Taladro, km 50–55 of rd. from Duitama to Virolín, 2280 m, 6 Dec. 1978, *Díaz-P. 1635* (COL); Mpio. Charalá, Correg. Virolín, near Río de la Pescada, 1830 m, 13 May 1982, *Valbuena & Harker 038* (COL); Mpio. Charalá, Correg. Virolín, rd. to Olival, Vda. Reloj, 1700 m, 3 Mar. 1981, *Díaz-P. 2270* (COL); Correg. Virolín, 2180 m, *Escobar et*

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Figure 4. *Siparuna lozaniana* Renner & Hausner (*Camargo-G. & Huertas-G. 7875*, COL, except where indicated). —a. Female specimen. —b. Male flower (*Rangel 2171*, COL). —c. Longitudinal section through a male flower (*Díaz-P. 2270*, COL). —d. Male inflorescence (*Rangel 2171*, COL). —e. Young fruit with minute tubercles near the base. —f. Female flower. —g. Leaf venation. —h. Male inflorescences (*Rangel 2171*, COL). Drawn from representative paratypes.

b
h
1 mm
2 cm
a
5 cm
c
1 mm
f
1 mm
d
e
5 mm
g
1 cm
5 cm

al. 3072 (HUA); Mpio. Charalá, 2180 m, 8 May 1986, *Moreno & Méndez 78* (COL); Charalá, 1990 m, 20 Aug. 1979, *Rangel 2171* (COL, U, US); Mpio. Gámbita, Vda. El Taladro, 2150 m, 13 Nov. 1981, *Camacho et al. 92* (COL), *Orozco 1018* (COL); vic. of Bogotacito, 1800 m, 27 Nov. 1978, *Díaz-P. 1204* (COL); rd. Arcabuco to La Palma, 3 July 1971, *Guarín M. & Villarreal 1070* (UPTC).

Siparuna calantha (Perkins) Renner & Hausner, stat. nov. Basionym: *Siparuna riparia* var. *calantha* Perkins, Notizbl. Bot. Gart. Berlin-Dahlem 10: 164. 1927. TYPE. Colombia. Magdalena: Sierra Nevada de Santa Marta, Las Nubes, ca. 1500 m, male specimen, Dec. 1898, *H. H. Smith 847* (holotype, B destroyed; isotypes, BM, BR, COL, E, F, G, GH, K, L, LE, LL, MO, NY, P 3 sheets, S, U, UC, US). Figures 3 and 5.

Dioecious shrub or treelet, 1–10 m tall and reaching a DBH of at least 7 cm, the young branchlets distinctly angular, densely brown puberulous or pilose. Leaves in whorls of 3, often unequal in size and petiole length, the petioles 2–9 cm long, the lamina drying dark brown, papery to chartaceous, obovate, 16.5–27 × 7.5–15.5 cm, the base acute, obtuse, or almost rounded, the apex acute or acuminate, the tip to 1.3 cm long, both surfaces loosely covered with small appressed or upright stellate hairs especially along the midrib, with 12 to 18 pairs of secondary veins, these flat above, distinctly raised below, the margin doubly serrate or dentate. Cymes 2–4 cm long, with 10 to 15 flowers, sparsely pubescent with spreading few-branched hairs. Male floral cup at anthesis 2.5–3.5 mm diam. and 2–2.5 mm high, broadly obconical, tepals mostly 5, broadly triangular, when fresh yellowish green, turning yellow, the floral roof moderately raised, glabrous and membranaceous; stamens 20 to 22, the filaments broad and membranaceous. Female flowers at anthesis similar to the male flowers, the floral roof slightly raised and glabrous; styles 5 to 8. Fruiting receptacle globose, 1–1.5 cm diam., with conspicuous protuberances 1–7 mm long, these either simple or flat and branched, soft when fresh (Fig. 5), fruit and tubercles with few minute stellate hairs; when fresh and mature whitish, cream or yellow, strongly lemon-scented or with a pungent odor; drupelets 2 to 5.

Distribution (Fig. 3), *habitat, and phenology.* *Siparuna calantha* is endemic on the Sierra Nevada de Santa Marta, where it occurs in upper montane forest at elevations between 1200 and 2000 m. Flowering and fruiting collections have been made in most months of the year.

The type of *Siparuna riparia* var. *calantha* Perkins, *H. H. Smith 847*, is a male plant, and Perkins therefore could not have known that female plants of this entity would have spiny fruits. A female plant had in fact been collected by Smith (*H. H. Smith 2508*) a few months earlier also on the Sierra de Santa Marta, but unfortunately Perkins appears not to have received it on loan. She initially identified *Smith 847* as "*S. patelliformis*?" (a Central American synonym of *S. gesnerioides*) but later described it as a variety of the Mexican *S. riparia* (a synonym of *S. thecaphora*), apparently in an attempt to accommodate the deeply serrate leaf margins of the Sierra Nevada material. The type of *S. riparia*, *Galeotti 269* (BR 3 sheets, G, K 2 sheets, LE, P 3 sheets, W destr., Macbr. photo 30014), is indeed one of few specimens of *S. thecaphora* that have distinct leaf teeth. Even so, Perkins's assignment of *Smith 847* to *S. riparia* remains problematic, because the leaves of *S. calantha* are about three times the size of those of the type of *S. riparia*, not to mention the implied Veracruz–Santa Marta disjunction.

The Sierra Nevada de Santa Marta, a geographically isolated mountain range, is known to harbor many locally adapted, morphologically distinct forms, and we therefore prefer to recognize *S. calantha* at the species level, rather than ranking it as a subspecies of the morphologically similar *S. petiolaris* from Antioquia, Quindío, and Valle. The two species resemble each other in the spiny fruiting receptacles and serrate leaf margin, but differ in leaf width (*S. petiolaris* has narrow, lanceolate leaves and *S. calantha* relatively broad, obovate ones) and number of carpels (5 to 8 in *S. calantha* vs. 3(4) in *S. petiolaris*). Fruiting receptacles in *S. petiolaris* measure 0.6–1 cm in diameter, while those of *S. calantha* reach 1–1.5 cm in diameter.

Paratypes. COLOMBIA. **Magdalena:** Sierra Nevada de Santa Marta, flanco occidental, Mpio. Ciénaga, 1350 m, 3 Apr. 1960, *Romero-Castañeda 8254* (AAU, COL, NY, US); Sierra Nevada de Santa Marta, Quebrada Indiana, 1600 m, 27 Aug. 1972, *Kirkbride 1943* (AAU, COL, NY, US), 30 Aug. 1972, *Kirkbride 2007* (COL, NY, US); Quebrada Botella, 1700 m, 29 Sep. 1972, *Kirkbride 2258* (AAU, NY, US); W of Quebrada Botella along trail to San Pedro de la Sierra, 2000 m, 6 Oct. 1972, *Kirkbride 2411* (COL, NY, US); La Gran Vía to San Pedro de la Sierra, 1540 m, 10 May 1983, *Escobar & Santa 3469* (HUA, NY); Alto de Mira, 1100–1500 m, 16 June 1989, *Madriñán 334* (MO); Alto de Mirador, Sierra Nevada de Santa Marta, 1200 m, 11 Mar. 1992, *Gentry & Saenz 76256* (MO), *Gentry & Saenz 76288* (MO); Sierra Nevada de Santa Marta, El Campano, transect 10–11, 1700 m, 11 June 1993, *Gentry & Ortíz 79848* (MO).

Figure 5. *Siparuna calantha* (Perkins) Renner & Hausner (*Gentry & Ortiz 79848*, MO, paratype). Fruiting specimen (scale bar equals 10 cm).

Figure 6. *Siparuna vasqueziana* Renner & Hausner. —a. Female specimen (*Rojas et al. 0280*, MO, paratype; scale bar equals 10 cm). —b. Male inflorescence and flower (*Vásquez et al. 24278*, MO, paratype; scale bar equals 1 cm). —c. Male specimen (*Vásquez et al. 24278*, MO; scale bar equals 10 cm).

Siparuna vasqueziana Renner & Hausner, sp. nov. TYPE: Peru. Amazonas: Distr. El Cenepa, Comunidad de Tutino, Pumpu-entsa, primary forest, 340 m, male, 28 June 1997, *R. Vásquez, A. Peña, E. Chávez & E. Quiaco 24278* (holotype, AMAZ not seen; isotypes, F, HUT not seen, MO, MOL not seen, NY, USM not seen, W) . Figures 3 and 6.

Differt a *Siparuna macrotepala* Perkins foliis majoribus (26–37 × 17–19 cm vs. 9–23 × 5–11 cm), floribus majoribus, tepalis longis (3–10 × 1.5–3.5 mm vs. 0.6–4 × 0.3–0.6 mm).

Dioecious treelet, 4–5 m tall, branchlets distinctly quadrangular, flattened at the nodes, with short, simple or few-branched hairs. Leaves opposite, sometimes unequal in size and petiole length, the petioles 2.5–9.5 cm long, the lamina drying greenish brown, papery and brittle, broadly obovate, 26–37 × 17–19 cm, the base obtuse, rounded, or truncate, the apex short-acuminate, both surfaces with scarce short simple, bi-, or trifid hairs, with 16 to 18 pairs of secondary veins, these flat above, distinctly raised below, the margin denticulate, the teeth most pronounced near the blade base. Cymes up to 7.5 cm long in the male, 3- or 4-branched (Fig. 6c), often on leafless nodes, with 10 to 12 flowers, pubescent like the branchlets. Male floral cup at anthesis 1.3–2.1 mm diam. and 1.1–1.6 mm high, subglobose, with short (0.05–0.2 mm long) simple to three-branched whitish hairs, some of these also on the tepal surfaces and margins, the 4 tepals spatulate to oblong (Fig. 6b), 3–10 × 1.5–3.5 mm, fresh yellowish, the floral roof moderately raised, glabrous; stamens 22 to 24. Female flowers at anthesis similar to male flowers, the floral cup 3.3–3.7 mm diam. and 3–3.5 mm high, the floral roof tightly surrounding the styles; styles 15 to 20. Receptacle in young fruits smooth (*Vásquez et al. 22423*), mature fruits unknown.

Distribution (Fig. 3), *habitat, and phenology.* *Siparuna vasqueziana* currently appears to be restricted to Peruvian Amazonian primary forests at elevations of up to 400 m.

Etymology. The species is named to honor its collector, Rodolfo Vásquez, curator of Peruvian material at the Missouri Botanical Garden and author of the first comprehensive florula for the Peruvian Amazonian lowlands (Vásquez Martínez, 1997).

Siparuna vasqueziana has much longer tepals than any other species of *Siparuna* known. Among Ecuadorean and Peruvian species, it is further distinct by its combination of strongly quadrangular branchlets and large smooth (not bullate) leaves. Similar quadrangular branches are seen only in *S. macrotepala*, but that species has smaller leaves and much shorter tepals (cf. the Latin diagnosis above, which contrasts the two species in terms of leaf size and tepal length).

Paratypes. PERU. **Amazonas:** Distr. El Cenepa, Comunidad de Mamayaque, 400 m, 11 Aug. 1997, *Rojas 0280* (F, MO, NY, US, W); Distr. El Cenepa, Comunidad de Mamayaque, Río Cenepa, Quebrada Sáasa, 400 m, 6 Feb. 1997, *Vásquez et al. 22423* (AMAZ, F, HUT not seen, MO, MOL not seen, NY, USM not seen, W). **Loreto:** Distr. Las Amazonas, Explornapo camp, 140 m, 6 Jan. 1993, *Vásquez 18285* (MO).

Acknowledgments. We thank José Luís Fernández Alonso (COL), Ricardo Callejas (HUA), and curators of the smaller Colombian herbaria cited in this paper's introduction for gracious permission to study *Siparuna* material in their care. Barbara Alongi is thanked for the two drawings and Santiago Madriñán (Universidad de Los Andes, Bogotá) for being a wonderful host during SR's visits to Bogotá.

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Two New Species in *Oritrophium* and *Floscaldasia* (Asteraceae: Astereae) from the High Andes of Ecuador

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ABSTRACT. Two new species from the family Asteraceae, tribe Astereae, were collected during botanical investigations in the Ecuadorian Andes. *Oritrophium llanganatense* Sklenář & H. Robinson and *Floscaldasia azorelloides* Sklenář & H. Robinson are here described and illustrated. *Oritrophium llanganatense* is distinct from other species of the genus by a combination of abaxially lanate leaves with outer phyllaries narrowly ovate to oblong. *Floscaldasia azorelloides* differs from the other species of the genus by its three-lobed leaves. The two species inhabit the upper superpáramo and are restricted to remote areas of the Ecuadorian Eastern Cordillera.

RESUMEN. Dos nuevas especies de la familia Asteraceae, tribu Astereae, se colectaron durante investigaciones botánicas en el superpáramo del Ecuador. Las dos especies, *Oritrophium llanganatense* Sklenář & H. Robinson y *Floscaldasia azorelloides* Sklenář & H. Robinson, se describen e ilustran. *Oritrophium llanganatense* difiere de las otras especies del género por tener hojas lanosas abaxiadamente y brácteas exteriores ovadas a oblongas. *Floscaldasia azorelloides* difiere de las otras especies del género por tener las hojas trilobadas. Las especies se encuentran en el superpáramo alto en áreas remotas de la Cordillera Oriental del Ecuador.

In the last few years, the flora and vegetation of the Ecuadorian superpáramo have been studied by the senior author. During several field trips to remote and infrequently visited areas of the Eastern Cordillera, new species of *Oritrophium* and *Floscaldasia* were collected. The species are here described, illustrated, and compared with other species, and their ecology and distribution are briefly discussed.

The genus *Oritrophium* (HBK) Cuatrecasas has been recently treated by Cuatrecasas (1997) with the report of 19 species and 6 subspecies. One additional species has since been described from the Mexican highlands (Nesom, 1998). The genus ranges from Mexico to southern Bolivia, with no reports from the mountains of Central America. Most species of *Oritrophium* occur in Venezuela, Colombia, and Ecuador, where they typically inhabit wet parts of páramos (Cuatrecasas, 1997). The position of the genus in the tribe Astereae has been discussed by Nesom (1992) and Cuatrecasas (1997).

Oritrophium llanganatense Sklenář & H. Robinson, sp. nov. TYPE: Ecuador. Tungurahua: Cerro Hermoso, SW ridge of mountain, humid upper superpáramo vegetation on wet rocks, 1°14′S, 78°18′W, 4200–4300 m, 6 Sep. 1997, *P. Sklenář & V. Sklenářová 3651* (holotype, QCA; isotypes, PRC, QCNE). Figure 1A.

In bracteis involucri inaequalibus linearibus vel oblongis *Oritrophio limnophilo* (Schultz Bip.) Cuatrecasas similis sed in foliis abaxialiter lanatis differt.

Small perennial rosettiform herb with short rhizome-bearing fibrous roots; rhizome 1–2 × 0.5–1.0 cm, ± vertical. Leaves 12 to 20 in rosette, spreading; petioles 4–7 × 1.5–2.5 mm, lower part and basal sheaths with long, persistent, creamy-white, silky hairs at margins covering leaf bases; blades firm, flat with revolute entire margins, adaxially bright yellowish green, glabrous, abaxially densely sordid lanate except for the midrib, narrowly ovate, acute, 15–20 × 4–8 mm; center of rosette producing up to 5 scapes covered with white hairs, bearing narrowly elliptic-oblong alternate bracts 4–7 × 1.5–1.6 mm, sparsely white lanate abaxially. Capitula terminal, solitary, 5–6 mm high, 5–7 mm wide; involucre with phyllaries 3- to 4-seriate, unequal, glabrous, bright to dark green, dark purple at apices or from upper third, margins membrana-

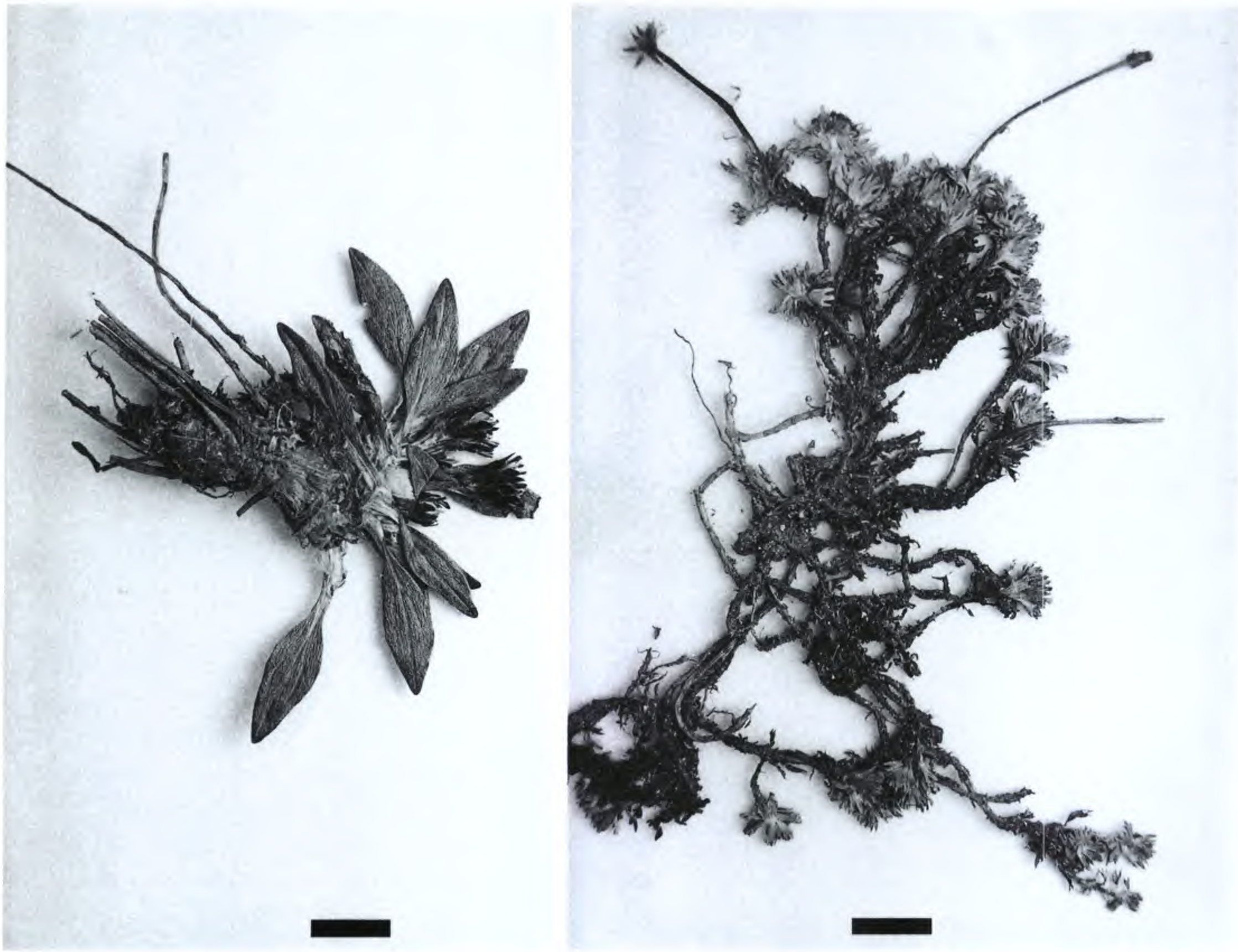

Figure 1. —A (left). Habit of *Oritrophium llanganatense* Sklenář & H. Robinson. —B (right). Habit of *Floscaldasia azorelloides* Sklenář & H. Robinson. From isotypes. Scale bar = 1 cm.

ceous, apex shortly ciliate; outer phyllaries 4–5 × 1.4–1.8 mm, narrowly ovate to oblong; inner phyllaries narrowly elliptic to linear-lanceolate to linear, 5.5–6.5 × 0.7–1.1 mm, shortly acute. Ray florets 20 to 28 per capitulum, corollas 3.5–4.1 mm long; limb white, linear to narrowly oblong-lanceolate, canaliculate, apex acute, 1.6–1.8 × ca. 0.2 mm, tube pale greenish, with scattered short trichomes, which are longer and more numerous at the tube-ligule junction, 2.1–2.2 × ca. 0.2 mm; style 3.8–4 mm long, with style branches 0.9–1.1 mm long, brownish in upper half; pappus 3.0–3.3 mm long, brownish below, yellow-brown above middle, scabrid; cypselas shortly white sericeous, not seen mature. Disc florets 7 to 10 in capitulum, corollas 3.0–3.2 mm long, pale green, narrowly funnelform, with 5 equal triangular lobes 0.3–0.4 mm long, corollas outside with scattered short trichomes and multicellular glands, which are longer and clustered at the tube-limb junction, trichomes short and more numerous on lobes; style branches ca. 0.8 mm long, densely papillate, linear-lanceolate; anther thecae 1.0–1.1 mm long, apical appendages ca. 0.2 mm long; pappus 2.9–3.1 mm long, yellow-brown; cypselas shortly sericeous with white straight setulae, mature ones not seen.

Because of the hairy leaf sheaths and the broad outer phyllaries, *Oritrophium llanganatense* would key to *O. limnophilum* in Cuatrecasas (1997), the only other species in the genus with such involucral bracts. From this species, *O. llanganatense* differs by the bright yellowish green color of the upper surface, the densely lanate lower surface, and the revolute margins of the leaves. The name of *O. llanganatense* is derived from the name of the Llanganatis National Park, where the species was collected.

Paratypes. ECUADOR. **Tungurahua:** Cerro Hermoso, SW ridge of the mountain, sparse vegetation of the upper superpáramo on wet rocks with shallow soil, rich bryophyte cover, 1°14′S, 78°18′W, 4300 m, 6 Sep. 1997, *P. Sklenář & V. Sklenářová 3630* (MO, QCA, US).

The genus *Floscaldasia* Cuatrecasas, previously credited with one species, *F. hypsophila* Cuatrecasas, was described from the Colombian páramo

(Cuatrecasas, 1969). It was distinguished from other genera of the tribe by the structure of the pappus, which had segments smooth and somewhat curved, formed by cylindrical cells (Cuatrecasas, 1969). Nesom (1993, 1994) has studied the subtribal classification of the genus. *Floscaldasia* closely resembles the genus *Laestadia* Kunth ex Lessing, from which it differs primarily by the presence of a pappus. For years, the genus was considered endemic to the páramos of Colombia (Cuatrecasas, 1969; van der Hammen & Cleef, 1986). However, recently a specimen previously determined as *Laestadia* from northern Ecuador was recognized as *F. hypsophila* (Nesom, 1993).

Floscaldasia azorelloides Sklenář & H. Robinson, sp. nov. TYPE: Ecuador. Chimborazo/Morona Santiago: Cerros Yuibug–Pailacajas (4730 m a.s.l.), rocky slopes on the E side of the mountain ridge, very humid upper superpáramo with cushions of *Werneria humilis* and grasses of *Calamagrostis podophora* and *Agrostis* spp., 1°45′S, 78°27′W, 4400 m, 31 July 1997, *P. Sklenář & V. Sklenářová 2950* (holotype, QCA; isotypes, AAU, MO, PRC, QCNE, US). Figure 1B.

A *Floscaldasia hypsophila* in foliis trilobatis differt.

Small rosettiform perennial herb with ramified, horizontally spreading, creeping rhizome; rhizome brownish yellow in older, and pale greenish in younger parts, with membranaceous bracts; short stem bearing terminal rosette of small leaves. Leaves alternate, sessile, 10 to 18 in cluster, pale green to yellowish green, glabrous or with few, short, appressed hairs along the veins, flat, 4–6 × 1.2–1.8 mm, narrowly oblong to oblong, membranaceous at the base, 3-lobed at apices, but a few leaves with 1 or 2 smaller additional lobes, lobes subequal, 1.0–1.5(–1.8) × 0.3–0.7 mm, acute. Capitula terminal, solitary, subsessile at onset of anthesis, becoming long pedunculate, up to 4 cm long, puberulous with scattered glandular dots, with a few small bracts. Individual capitulum 2.5–3.0 mm high, 4.5–6.0 mm wide; phyllaries 2- to 3-seriate, pale green to green, glabrous, purple at apices, 2.5–2.8 × 0.7–1.1 mm, narrowly elliptic-oblong, shortly ciliate at the apices, margins membranaceous. Ray florets female, 35 to 45 per capitulum, corolla with limb purple to dark purple (occasionally light purple to yellowish), 0.9–1.1 mm long, entire to bidentate at apex, narrowly linear-lanceolate, canaliculate, spreading, tube 0.8–0.9 mm long, pale greenish to brownish yellow, with numerous short biseriate hairs; style 1.3–1.4 mm long, branches 0.3–0.4 mm long, brown, papillate, triangular-oblong; pappus 1.0–1.3 mm long with few bristles much shorter, golden brown, smooth, somewhat curved. Disc florets functionally staminate, 9 to 11 per capitulum, corolla 1.6–1.8 mm long, with limb light to dark purple, limb 1.1–1.2 mm long, with 5 triangular acute lobes, lobes 0.4–0.5 mm long, throat with numerous short biseriate hairs, tube 0.5–0.7 mm long, pale green; styles ca. 1 mm long, exceeding the lobes; anthers 0.6–0.7 mm long; pappus 1.5–1.6 mm long with few shorter bristles, otherwise as in ray florets. Achenes laterally compressed, biconvex, 1.4–1.6 × 0.5–0.6 mm, in rays more strongly arched and with numerous glandular dots mostly along outer margin, in disc florets more symmetric and with few glands.

Floscaldasia azorelloides is unmistakably congeneric with *F. hypsophila* by the form of the heads being terminal, solitary, subsessile becoming long pedunculate and because of the smooth bristles of the pappus. The new species has the general habit of *F. hypsophila*, although it has slightly smaller capitula and florets, and also shares similar ecological requirements. However, it is unquestionably distinct in the 3-lobed leaves. The leaves of *F. azorelloides* resemble those of several Ecuadorian *Azorella* Lamarck species, e.g., *A. corymbosa* (Ruiz & Pavón) Persoon, and the species is named accordingly.

Paratypes. ECUADOR. **Chimborazo:** El Altar, N side of the volcano, humid superpáramo on the ridge below the Canoningo peak, 1°41′S, 78°24′W, 4400 m, 19 Aug. 1995, *P. Sklenář & V. Kostečková 93–13* (QCA, QCNE), 4500 m, *P. Sklenář & V. Kostečková 90–6* (AAU, US). **Pichincha/Napo**: W side of a mountain ridge ca. 2 km to the W from Cerro SaraUrcu, humid superpáramo on metamorphic rocks, 0°06′S, 77°57′W, 4400 m, 29 Aug. 1995, *P. Sklenář & V. Kostečková 102–8* (PRC, QCA), mountain ridge, 4200–4350 m, 30 Aug. 1995, *P. Sklenář & V. Kostečková 1158* (AAU), 4350–4400 m, 30 Aug. 1995, *P. Sklenář & V. Kostečková 1179* (QCA). **Chimborazo/Morona Santiago:** Cerros Yuibug–Pailacajas (4730 m a.s.l.), along a small stream on the E side of the mountain ridge, humid cushion superpáramo with *Azorella*, *Werneria humilis*, *Valeriana*, and many mosses, 1°45′S, 78°27′W, 4200 m, 31 July 1997, *P. Sklenář & V. Sklenářová 3040* (PRC, QCA).

Distribution and Ecology

The two described species occur in the open, patchy vegetation of the upper superpáramo (sensu Cleef, 1981) in very humid areas of the Ecuadorian Andes (Fig. 2). The species *Oritrophium llanganatense* is known from one locality. It was collected in permanently moist habitats in shallow soils around rocks, usually associated with abundant

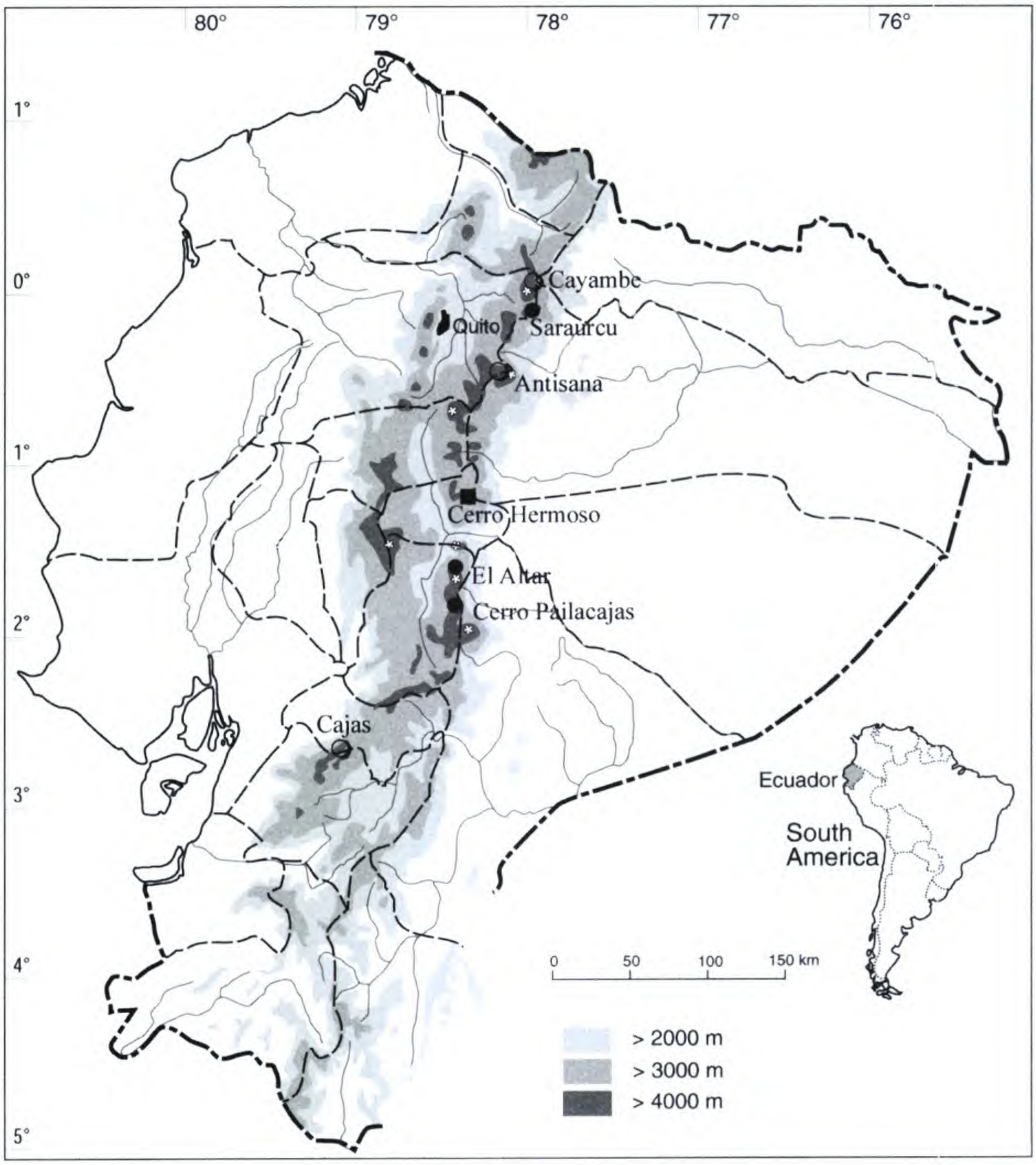

Figure 2. Distribution of *Floscaldasia azorelloides* (●), *F. hypsophila* (○, near Cayambe, Antisana, and Cajas), and *Oritrophium llanganatense* (■, near Cerro Hermoso) in Ecuador; white stars indicate major ice-capped volcanoes.

bryophytes. The species *Floscaldasia azorelloides* was collected from altitudes between 4200 and 4500 m, where it forms loose mats in very shallow, wet, sandy substrata on both metamorphic and igneous bedrock. The other species of the genus, *F. hypsophila*, is known from similar environments from high altitudes, (3900–)4100–4550 m. Besides the first Ecuadorian locality from Cayambe (Nesom, 1993), the species was repeatedly collected on Volcán Antisana in northern Ecuador, and there is a record from Cajas National Park in the southern part of the country (P. Sklenář, unpublished data). Its known distribution in Ecuador is shown in Figure 2; the distribution in Colombia is given by van der Hammen and Cleef (1986: fig. 7–3d). Unlike *F. azorelloides*, the plants of *F. hypsophila* were found growing upon the surface of cushion plants such as *Distichia* Nees & Meyen and *Xenophyllum* V. A. Funk (Cleef, 1978; P. Sklenář, pers. obs.). Due to its limited occurrence at the highest elevations, the genus *Floscaldasia* represents a typical superpáramo element (see also van der Hammen & Cleef, 1986).

Despite recent research, the remote areas of the Eastern Cordillera of Ecuador remain botanically poorly known. The newly described species are both known from only a few localities. However, further exploration may expand their geographical range within, and perhaps also outside, the country. This is especially plausible in *Floscaldasia azorelloides*, since this species can easily be overlooked in the field.

Acknowledgments. The fieldwork of P.S. was

supported by the Danish Research Academy (Forskerakademiet) and by the Grant Agency of the Czech Republic (grant no. 206/97/0336). The INEFAN is thanked for issuing collecting permits. H. Balslev and R. Valencia are thanked for general support during fieldwork. The taxonomical study at the U.S. National Herbarium was supported by a short-term visitor grant from the OFG, Smithsonian Institution, to P.S. ; the visit was organized by V. Funk. J. Pruski is thanked for information on the latest publications about *Oritrophium*. V. Hollowell, G. Nesom, and one anonymous reviewer provided valuable comments on the manuscript. C. Ulloa kindly revised the Spanish text. Curators of the herbaria F, MO, QCA, QCNE, and US are thanked for access to their collections.

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Valeriana eupatoria (Valerianaceae), a New Species from Rio Grande do Sul, Brazil

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ABSTRACT. *Valeriana eupatoria*, a new species native to *Araucaria* forests from upland Rio Grande do Sul, southern Brazil, is described and illustrated. It is apparently related to *V. chamaedryfolia*, from which it is set apart chiefly by its larger inflorescences and non-lobate, pubescent, and larger leaves.

RESUMEN. Se describe e ilustra *Valeriana eupatoria*, una nueva especie nativa de los bosques montanos de *Araucaria* de Rio Grande do Sul, en el sur de Brasil. La especie aparentemente está relacionada con *V. chamaedryfolia*, de la cual se diferencia principalmente por las inflorescencias más grandes y sus hojas no lobadas, enteras, pubescentes y más grandes.

The familial status of Valerianaceae is debatable in light of recent studies; Judd et al. (1994) merged it in Caprifoliaceae based mainly on morphological and anatomical similarities. Molecular studies (APG, 1998; Backlund & Pyck, 1998; Pyck et al., 1999) point to the close relationship of both groups, establishing the derivation of Valerianaceae from a caprifolioid ancestor; these authors, in spite of the opinion of Judd et al. (1994), maintain Valerianaceae as a separate family. I have chosen to follow their lead. If maintained as a separate family, the Valerianaceae comprise from 9 (Gunn et al., 1992) to 13 (Cronquist, 1981) genera. *Valeriana* is the largest genus in the family, with about 300 species (Cronquist, 1981).

Valeriana L. in South America attains its highest diversity in the Andes; the Brazilian species are disjunct from this Andean stock and restricted chiefly to montane habitats in southern and eastern regions of the country, from Minas Gerais to Rio Grande do Sul, showing a marked southward increase in number of species. The last thorough taxonomic revision of *Valeriana* in Brazil listed 15 species (Borsini, 1962). One more species was recently described (Sobral, 1999), and, during a study of the genus in Rio Grande do Sul, the southernmost state in Brazil, another unnoticed shrubby species was detected; it is herein described as new.

Valeriana eupatoria Sobral, sp. nov. TYPE: Brazil. Rio Grande do Sul: Linha Quinze, Gramado, 29°20′S, 50°53′W, Oct. 1997 (stam. fl), *M. Sobral & C. Miró 8604* (holotype, ICN; isotypes, FLOR, MBM, MO, RB, SP, US). Figures 1, 2.

Species nova *V. chamaedryfoliae* proxima, a qua foliis non lobatis, pubescentibus, foliis et inflorescentiis longioribus distincta est.

Dioecious, erect or occasionally prostrate, sympodially branching undershrubs or shrubs 0.5–1.5 m high. Twigs, leaves, and inflorescence axes pubescent with hyaline hairs 0.1–0.3 mm long. Leaves opposite, simple, lanceolate, elliptic-lanceolate or ovate-lanceolate, discolored when dried, pilose on both faces, more densely so abaxially, 8–13 cm long and 2.2–3.7 cm wide; apex narrowly acuminate; base cuneate and decurrent along the pseudopetiole; central nerve adaxially plane or sulcate, abaxially salient; secondary nerves 4 to 6 (8) pairs, plane or sulcate above and salient below, the second pair stronger than the others, the two first pairs sometimes diverging at a narrower angle than that of the other veins (about 30°); margins irregularly serrate, with 16 to 25 teeth 4–6 mm long near the blade midpoint; pseudopetiole 6–10 × 1–2 mm, the leaf bases connate across stem node. Inflorescences in terminal panicles, the staminate ones 40–50 × ca. 30 cm, the pistillate ones 20–30 × 10–18 cm, with 3 orders of branching to the ultimate dichasial units; bracts on the lower two nodes of the inflorescence 4–7 × 1.5–2.0 cm, similar to the leaves but occasionally with a pair of evident basal lobes, the other bracts much smaller, up to 20 mm long and 5 mm wide, acropetally diminishing in size. Bracteoles lanceolate, up to 0.4 × 0.2 mm. Flowers of both sexes sessile, pentamerous; calyx obsolete, generally reduced to a warty intumescence with no evident teeth at the base of the flowers, in some flowers hardly visible. Staminate flowers white, campanulate, 0.8–0.9 × 0.7–1.0 mm, the lobes acute, 0.4–0.5 × 0.4–0.5 mm; stamens 3, 1.0–1.2 mm long, the anthers globose, 0.3 × 0.2–0.3 mm, bithecal. Pistillate flowers

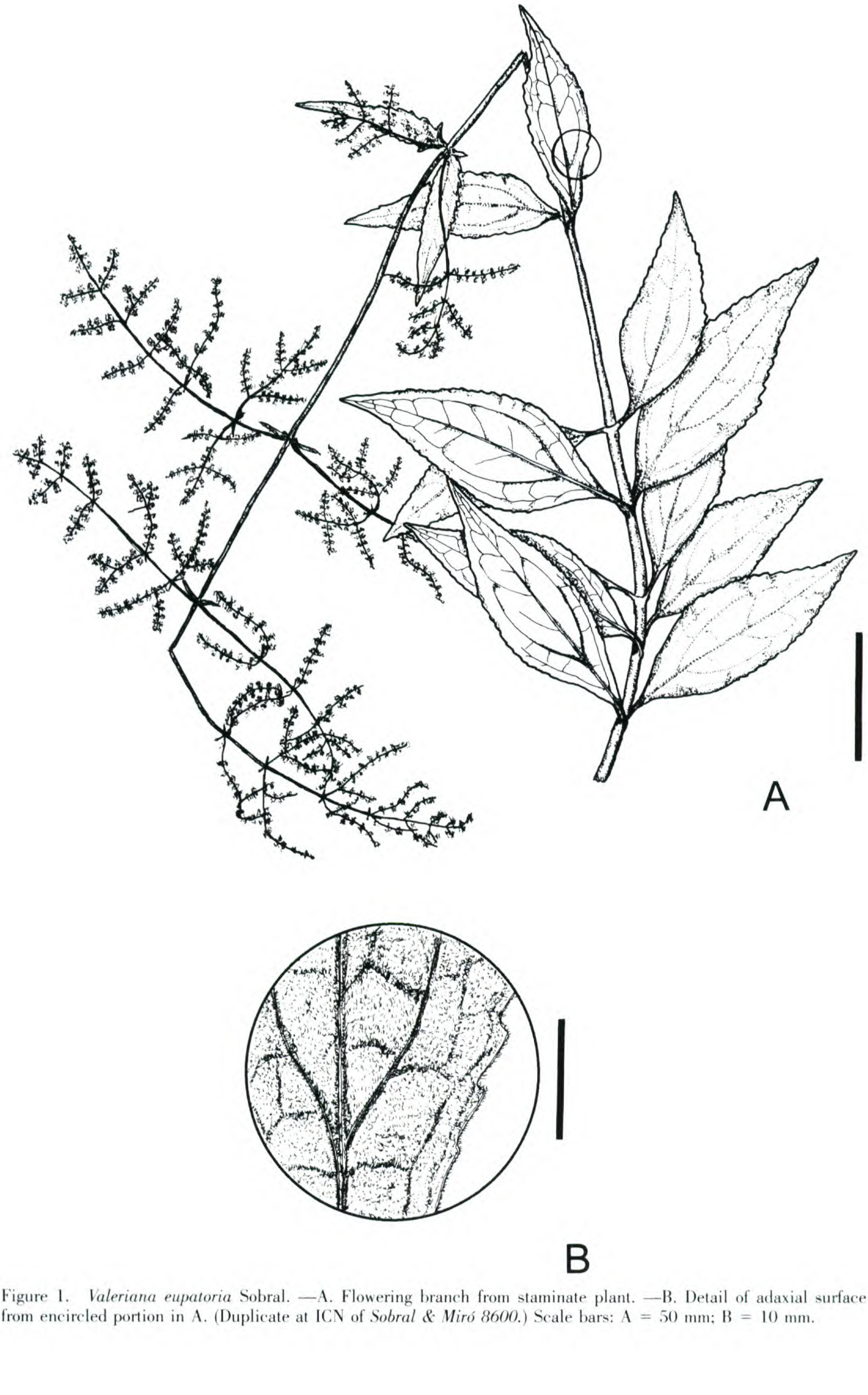

Figure 1. *Valeriana eupatoria* Sobral. —A. Flowering branch from staminate plant. —B. Detail of adaxial surface from encircled portion in A. (Duplicate at ICN of *Sobral & Miró 8600.*) Scale bars: A = 50 mm; B = 10 mm.

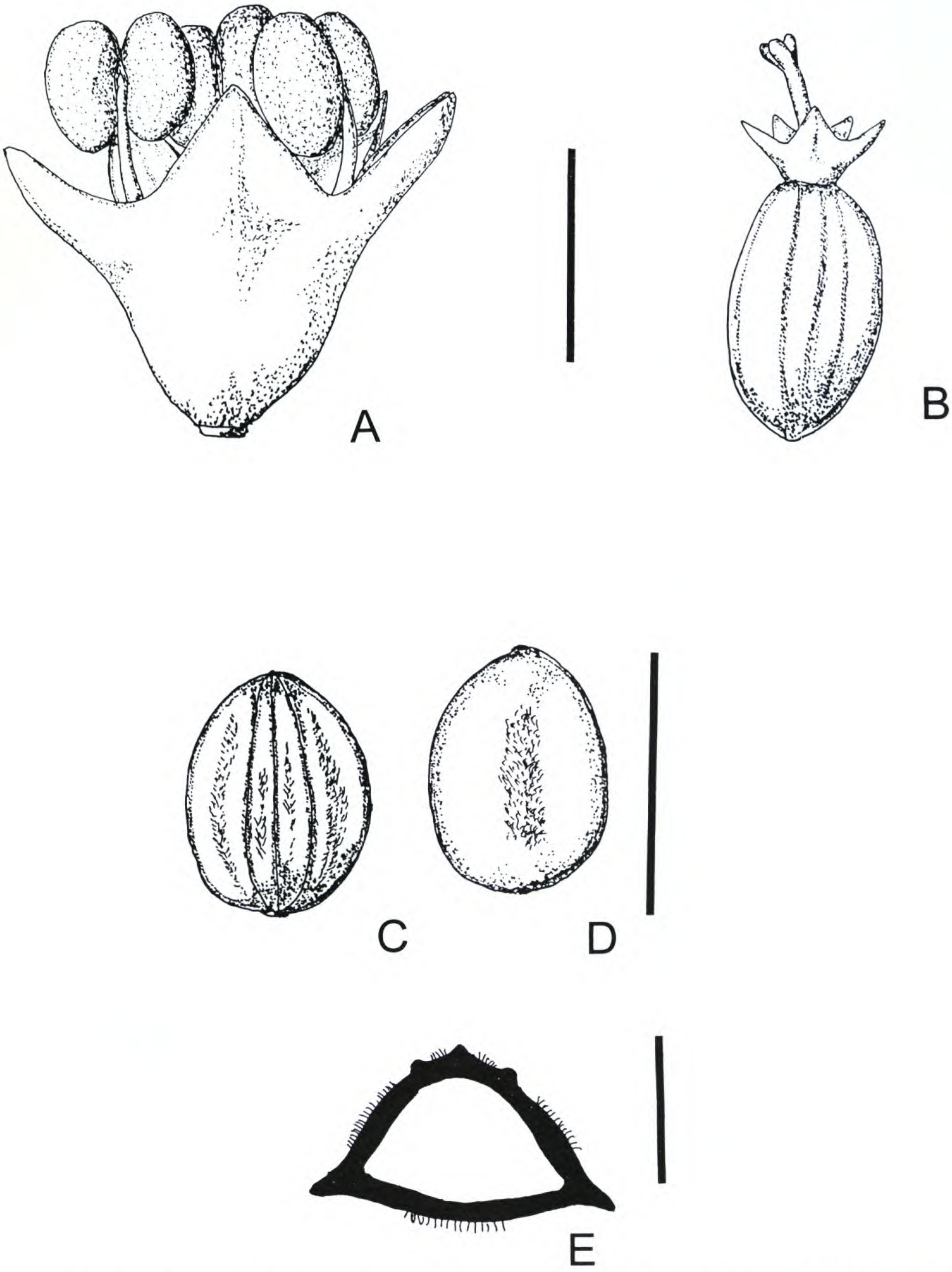

Figure 2. *Valeriana eupatoria.* Flowers and fruit. —A. Staminate flower. —B. Pistillate flower. —C. Fruit, abaxial view. —D. Fruit, adaxial view. —E. Fruit, transverse view. (A, *Sobral & Miró 8604*; B, *Sobral & Miró 8600*; C–E, *Sobral et al. 8713.*) Scale bars: A, B = 0.5 mm; C, D = 1 mm; E = 0.5 mm.

white, campanulate, 0.3–0.4 × 0.2–0.3 mm, the lobes acute and occasionally somewhat unequal, up to 0.2 × 0.1–0.2 mm; staminodes 3, up to 0.1 mm long, laminar and apically rounded; style 0.3 mm long, stigmas 3, papillose, 0.1 mm long; ovary 0.5 mm long, 5-ridged, unilocular, uniovulate. Fruits elliptical, somewhat transversely triquetrous, 5-costate, slightly hairy, 0.7–1.0 × 0.4–0.5 mm.

Valeriana eupatoria is close to *V. chamaedryfolia* Chamisso & Schlechtendal. Both species are known only from the state of Rio Grande do Sul, although their geographical distributions, as far as known, do not overlap. *Valeriana eupatoria* grows in the upland northeastern part of the state, in vegetational formations dominated by ombrophilous forests of *Araucaria angustifolia* (Bertoloni) Kuntze; *V. chamaedryfolia* thrives in rocky fields in central and southwestern Rio Grande do Sul, where vegetation consists mainly of rocky fields and drier forests devoid of *Araucaria*. Besides this ecological distinction, they can be set apart morphologically by the following characters:

1a. Leaves up to 7 cm long × 2 cm wide, glabrous or with scattered hairs along the nerves; some mature leaves with at least one pair of lobes at pseudopetiole bases; inflorescences up to 18 cm long; blades about 6 times longer than the pseudopetioles, these 13–18 mm long; leaf teeth up to 10, 4–7 mm long, evident in relation to blade width . . . . . *Valeriana chamaedryfolia*

1b. Leaves exceeding 7 cm, up to 13 cm long, exceeding 2 cm in width (to 3.7 cm), pubescent on both faces, more densely beneath; mature leaves never with a lobed base (although the bracts may occasionally be lobed); inflorescences 18–50 cm long; blades 12–20 times longer than the pseudopetioles, these 6–10 mm long; leaf teeth 16–25, 4–6 mm long, not always marked in relation to blade width . . . . . *Valeriana eupatoria*

Phenology. Flowers from August to December, fruits in December.

Distribution. Valeriana eupatoria is known from four municipalities of upland northeastern Rio Grande do Sul ("planalto" or "Serra Geral"), a montane region with altitudes up to 1200 m, dominated by *Araucaria* forests and cloud forests intermixed with fields.

Ecology. Shrub from forest edges in *Araucaria angustifolia* forests and occasionally edges of marshes and fields at 500–900 m above sea level.

Etymology. The species is named for the resemblance of its leaves to southern Brazilian species of the asteraceous genus *Eupatorium*. When sterile, *V. eupatoria* is easily confused with that genus.

Paratypes. BRAZIL. **Rio Grande do Sul:** Fazenda Potreirinho, Bom Jesus, Dec. 1977 (stam. fl), *Camargo 5553* (HAS, ICN); Itaimbezinho, Cambará do Sul, 20 Feb. 1953 (stam. fl), *Rambo 54070* (PACA), 13 Nov. 1953 (stam. fl), *Rambo 54488* (PACA); Linha Quinze, Gramado, 29°20′S, 50°53′W, Aug. 1997 (stam. fl), *Sobral & Diesel 8487* (ICN), Oct. 1997 (stam. fl), *Sobral & Miró 8600* (ESAL, FLOR, ICN, MBM, NY), Oct. 1997 (stam. fl), *Sobral & Miró 8601* (ICN, MBM), *Sobral & Miró 8602* (ICN, MBM, SP), Oct. 1997 (pist. fl), *Sobral & Miró 8603* (ICN, MBM, SP, US), Dec. 1998 (pist. fl), *Sobral et al. 8713* (ICN, MBM), *Sobral et al. 8714* (ICN, MBM, MO); Chapada, São Francisco de Paula, 18 Nov. 1984 (stam. fl) *Batista & Pilz s.n.* (ICN 117397).

Acknowledgments. I thank U. Braun (HAL), who kindly sent me a fine xerox copy of the isotype of *Valeriana chamaedryfolia*, and Donna M. E. Ware, Victoria Hollowell, Vinícius Souza, and an anonymous reviewer for their patient suggestions for improving this paper, as well as the various collectors of *V. eupatoria*—especially Suzete Diesel, who first introduced me to the interesting Linha Quinze site.

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Rinorea belalongii (Violaceae), a New Species from Borneo

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ABSTRACT. *Rinorea belalongii*, from dipterocarp forests in Brunei and probably also Sabah, is described and illustrated. It is distinct in its very long and sharply acuminate leaf blades, cauliflorous and ramiflorous inflorescences, stamens lacking ventral appendages, and gynoecium with densely short-puberulent ovaries and glabrous, expanded styles that are constricted just above the hairy bases.

Rinorea (Violaceae) is represented in Malesia by 14 species of mostly rather small trees. In the course of disentangling the complex variation pattern of *Rinorea longiracemosa* (Kurz) Craib, a species that appeared to range from Burma and Vietnam to Borneo (Jarvie & Stevens, 1998), a group of specimens from Brunei that probably represented an undescribed species was noted. Initially identified as *R. longiracemosa* (Kurz) Craib (Forman & Ahmad, 1996), flowering material of this taxon has since been collected, and it is described as *R. belalongii*. Whether or not *R. belalongii*, as well as the other taxa previously included in *R. longiracemosa*, are in fact particularly close to the latter remains to be seen. Since the flowers of *R. belalongii* are perhaps the most distinctive of those of any Malesian species, this suggests that it is not immediately related.

Rinorea belalongii P. F. Stevens, sp. nov. TYPE: Brunei Darussalam. Temburong District, Kuala Belalong Field Studies Centre, 85 m, 1 Mar. 1999, *Hemingway & Malcomber 130* (holotype, MO; isotypes, K, SAR). Figure 1.

A speciebus aliis *Rinoreae* in laminis in siccitate viride-vel flavido-brunneis et acuminibus longis usque ad 4.5 cm longis praeditis, inflorescentiis brevibus paucifloribus, antheris subglabris appendiculis ventralibus nullis, stylis base pilis densis brevibus praeditis tum constrictis tum demum inflatis, et ovariis fructibusve pilis densis brevibus praeditis, differt.

Shrub or small tree 1–3 m tall, DBH to 2 cm. Bark pale brown with lenticels. Twigs 1.3–1.8 mm across, glabrous or with sparse hairs; internodes (2–)3–7.5 cm long. Leaves distichous, minutely puberulent and with sparse adpressed brown hairs, or glabrous; stipules (3–)3–7.5 × 1–1.3 mm, striate, deciduous; petiole 1.5–4.5(–8) × 1.5–2 mm; lamina subovate-oblong, 15.2–ca. 38 × 4–9.8 cm, apex gradually and sharply acuminate, acumen to 4.5 cm long, base rounded to subcordate, ± asymmetrical, margin serrulate, 5 to 9 serrations/5 cm, texture chartaceous, surface drying greenish to yellowish brown, with sparse adpressed brown hairs on midrib below, very few on abaxial surface, or glabrous, venation eucamptodromous to brochidodromous, the latter on smaller leaves and toward the apex, midrib and secondaries slightly raised above, strongly raised below, secondaries 10 to 15 (perhaps to 18)/side, 8–30 mm apart, finer venation reticulate, obscure to slightly raised above, raised below, domatia absent. Inflorescences cauliflorous and ramiflorous, several together or branched from the base, axis 6–10 mm long, with 3 to 6 flowers, minutely puberulent; bracts and bracteoles with conspicuous brownish adpressed hairs, bracts 2.5–2.7 mm long, pedicels 4–6 mm long, puberulent, articulated at or somewhat above the middle, bracteoles 1.8–2.2 mm long, ca. ⅓ up. Sepals green-white, ovate, 4.8–5.5 × ca. 4 mm, with adpressed brownish hairs abaxially; petals white, ovate, ca. 9 × 3.5 mm, apex sharply cuneate, margins with a few minute hairs; stamens 10, subglabrous, filaments ca. 2.7 mm long, connate for the basal ca. 0.7 mm, anther thecae 2–2.2 mm long, with a few hairs at the base, the abmedial lateral walls ca. 1.7 mm long, connective appendage ca. 2 × 1.8 mm, triangular; ovary ca. 3 mm long, densely puberulent, 3 ovules/placenta, style continuous, ca. 4 mm long, puberulent at the base, contracted, then expanded, stigma indistinct. Capsule subellipsoid, ca. 2 × 1.5 cm, sepals at the base usually ± spreading, surface drying yellowish, smooth to furfuraceous, pericarp splitting into two layers; seeds straw-colored, ca. 7 × 6 mm, basally with an annulus ca. 3 mm across, umbo ca. 0.8 mm across.

Distribution and ecology. Rainforest at 50–85 m altitude. Flowering in February and March, fruiting in June and August.

The only specimen from Sabah, *SAN 85186*, that

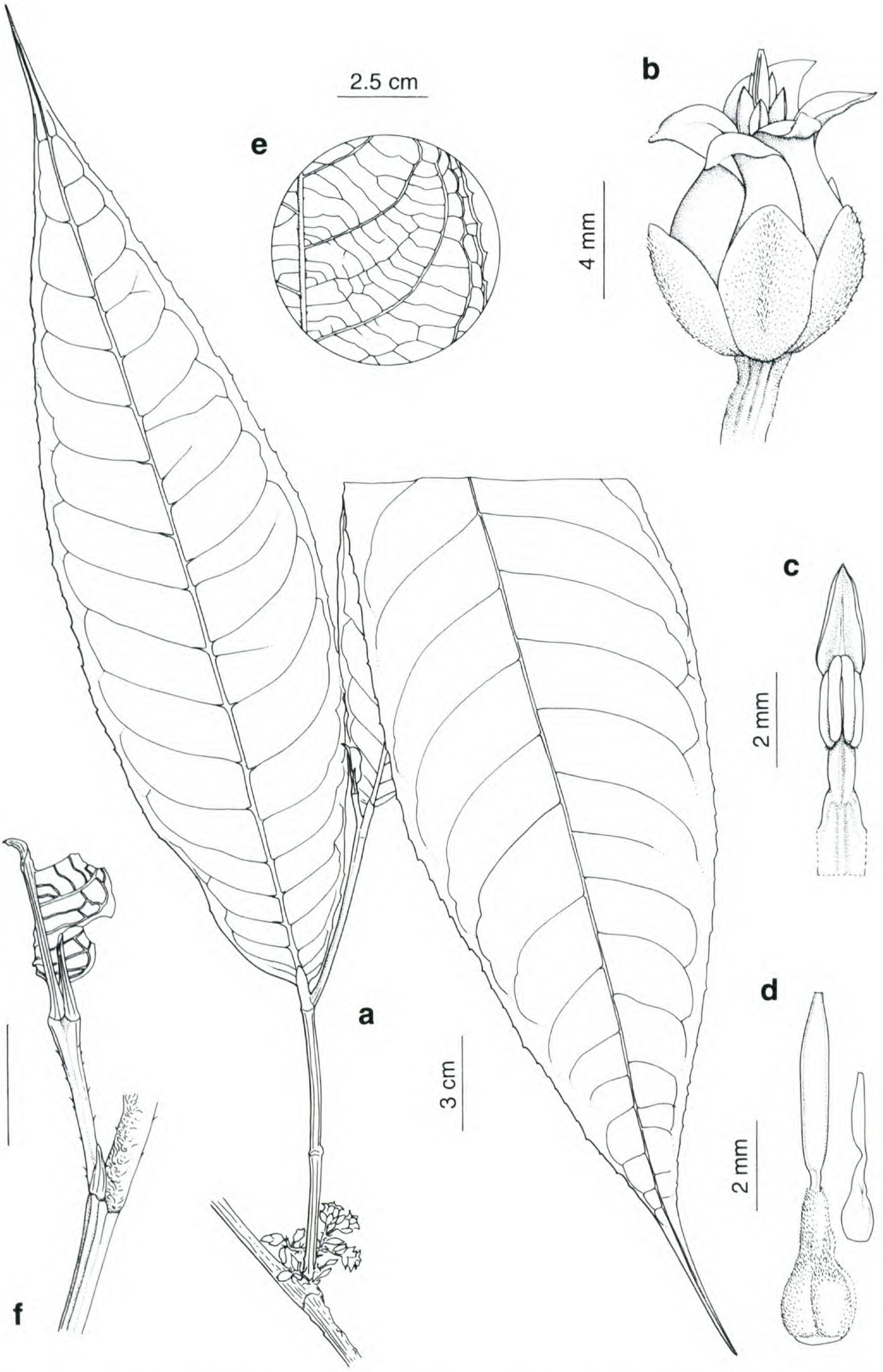

Figure 1. *Rinorea belalongii* P. F. Stevens. —a. Flowering shoot. —b. Flower. —c. Individual stamen, adaxial view. —d. Gynoecium, front and side views. —e. Details of the venation. —f. Apex of twig showing terminal bud enclosed by stipules. (From *Hemingway & Malcomber 130*, MO.)

may be assignable to this species has rather small sepals ca. 4.8 mm long (when dry) that are more or less adpressed to the capsule.

The inflorescence of *Rinorea belalongii* seems to be a reduced panicle or thyrse. The gynoecium is distinctive and quite unlike both that of any other species I have examined and also the descriptions in Jacobs and Moore (1971). The style is constricted just above the basal, hairy portion, and then considerably expands toward the apex; it later abscises at this constriction. Viewed from the side (Fig. 1D), the gynoecium appears to be monosymmetrical; however, the flower as a whole is basically polysymmetrical. Observations on living material are needed to confirm this. Although very different from the styles of other Malesian species, there is considerable variation in stylar morphology in Violaceae, including *Viola* itself, and in *Rinorea* elsewhere in its distributional range.

Rinorea belalongii may be inserted into the keys provided by Jacobs and Moore (1971) and Jarvie and Stevens (1998) as follows:

8. Inflorescences more or less elongate, or flowers few on a short (> 5 mm long) rachis; fruit 1.25–4 cm in diameter.
9. Stipules 1–3.5 mm long; inflorescences axillary, lacking basal perulae, 0.5–2.5 cm [mm in Jarvie & Stevens, 1998] long . . . . . *R. javanica* (Blume) Kuntze
9. Stipules (2–)4–21 mm long; inflorescences axillary, terminal, or terminating short shoots, with persistent basal perulae or their scars, 0.5–13 cm long.
9*. Inflorescences from defoliate axils, axis 0.6–1 cm long; anthers lacking ventral appendage, ovary densely short-puberulent . . . . . *R. belalongii*
9*. Inflorescences terminal or terminating short shoots, axis 3–13 cm long; anthers with distinct ventral appendage, ovary glabrous or with sparse hairs—see Jarvie and Stevens (1998) for the continuation of this part of the key.

Paratypes. BRUNEI. Temburong District, Sungei Temburong at Kuala Belalong, *Dransfield 6632* (A, K); S. Belalong, *K. M. Wong WKM 1165* (K); Kuala Belalong Field Studies Centre, 50 m, *Argent et al. 9135* (K). SABAH. **Lahad Datu:** Ulu Sg. Danum, near Kuala Segama, *SAN 85186* (K).

Acknowledgments. I am very grateful to Barbara Alongi for the fine illustration, to Harvey Ballard for comments, and to the directors of the herbaria cited for permission to examine their material.

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A New Combination in *Heteropolygonatum* (Convallariaceae, Polygonateae)

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ABSTRACT. During preparation of accounts for the genera in the Convallariaceae for the *Flora of China*, Volume 24, it was decided that *Polygonatum ginfushanicum* (F. T. Wang & Tang) F. T. Wang & Tang (*Smilacina ginfushanica* F. T. Wang & Tang) should be transferred to *Heteropolygonatum*, as *H. ginfushanicum* (F. T. Wang & Tang) M. N. Tamura, S. C. Chen & Turland.

Smilacina ginfushanica F. T. Wang & Tang was described in 1978 (Wang & Tang, 1978: 249), based on specimens collected from the mountain Jinfo Shan in Nanchuan County, Chongqing Province, China (*T. H. Hsiung & T. L. Chou 90841*, PE). Later, after examining additional specimens from Jinfo Shan (*T. H. Hsiung & T. L. Chou 91094*, PE; *Phytogeographical Research Team 239*, PE) and also from Jiangkou in northeastern Guizhou Province (*Z. S. Zhang et al. 400642*, PE), Wang and Tang (in Wang et al., 1983: 261) transferred the species into *Polygonatum*, as *P. ginfushanicum* (F. T. Wang & Tang) F. T. Wang & Tang. They considered that the existence of a terminal inflorescence in this species allied it with the genus *Smilacina*. However, they also observed an axillary inflorescence in addition to the terminal one (except in some specimens), tepals connate to a high degree, papillae present on the abaxial side of the tepal apex, and ovaries with four ovules per locule, all of which they considered as characteristics of *Polygonatum*. Hara (1987: 158) treated the species under *Smilacina*, and cited the combination in *Polygonatum* as a synonym, but noted "This species is till now doubtful to belong to *Smilacina* [sic]." Liu (1991: 236–237) considered it a member of *Polygonatum*. The species has also been collected in southwestern Hubei (Lichuan, 1300 m, 19 Apr. 1973, *H. G. Li 11080*, MO).

Recently, the genus *Heteropolygonatum* M. N. Tamura & Ogisu has been described (Tamura et al., 1997). It is similar to *Polygonatum*, but differs in possessing both terminal and axillary inflorescences (sometimes only a terminal inflorescence) and imbricate tepals. Originally, dimorphic stamen length had been considered characteristic of *Heteropolygonatum*, but this later turned out to be of no diagnostic value (Bao et al., 1998). However, the present authors still recognize *Heteropolygonatum*, and a molecular phylogeny of the tribe Polygonateae confirms this recognition (Yamashita et al., in press).

As Wang and Tang (in Wang et al., 1983) observed, *Polygonatum ginfushanicum (Smilacina ginfushanica)* has both terminal and axillary inflorescences (sometimes only a terminal inflorescence) and also imbricate tepals. These characters clearly indicate that the species belongs to *Heteropolygonatum*, so the combination in that genus is made here. Now *Heteropolygonatum* includes four species: *H. roseolum* M. N. Tamura & Ogisu (the type species), *H. pendulum* (Z. G. Liu & X. H. Hu) M. N. Tamura & Ogisu, *H. xui* W. K. Bao & M. N. Tamura, and *H. ginfushanicum* (F. T. Wang & Tang) M. N. Tamura, S. C. Chen & Turland, all of which are endemic to China (Chongqing, Guizhou, Hubei, and Sichuan Provinces and Guangxi Zhuang Autonomous Region). The generic description, key to the species, and specific descriptions will be pro-

vided in the forthcoming *Flora of China*, Volume 24 (Chen & Tamura, in press).

Heteropolygonatum ginfushanicum (F. T. Wang & Tang) M. N. Tamura, S. C. Chen & Turland, comb. nov. Basionym: *Smilacina ginfushanica* F. T. Wang & Tang, Fl. Reipubl. Popularis Sin. 15: 249, pl. 14, figs. 3–5. 1978. *Polygonatum ginfushanicum* (F. T. Wang & Tang) F. T. Wang & Tang, in F. T. Wang, Tang & S. Yun Liang, Acta Bot. Yunnan. 5: 261, t. 1. 1983 [as "*ginfoshanicum*"]. TYPE: China. Chongqing: Nanchuan County, "Gin-fu-shan" [Jinfo Shan], 1730–1800 m, *T. H. Hsiung & T. L. Chou 90841* (holotype, PE).

The specific epithet was spelled "*ginfushanica*" in the part of the protologue accompanying the Latin description and type designation (Wang & Tang, 1978: 249). However, in the accompanying key to species of *Smilacina* (p. 29), the Chinese description (p. 38), and the illustration caption (p. 43), the spelling "*ginfoshanica*" was used. Hara (1987) used the latter spelling. When the species was transferred to *Polygonatum* by Wang and Tang (in Wang et al., 1983), the epithet was spelled "*ginfoshanicum*," and likewise by Liu (1991). The type locality in the protologue was cited as "Gin-fu-shan," which uses the Wade-Giles system of transliteration from Chinese. The alternative, pinyin transliteration is "Jinfo Shan." One might argue that either "*ginfushanicum*" or "*jinfoshanicum*" would be correct, but not "*ginfoshanicum*." Therefore, the present authors adopt "*ginfushanicum*" and reject "*ginfoshanicum*"; see Article 61.3 of the *Tokyo Code* (Greuter et al., 1994).

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Yamashita, J., F. D. Pu, J. M. Xu, M. Ogisu, T. Inada & M. N. Tamura. In press. Molecular phylogeny of the tribe Polygonateae (Convallariaceae) based on DNA sequences of the chloroplast genes *trn*K and *rbc*L. Amer. J. Bot.

New Combinations in *Campylandra* (Convallariaceae, Convallarieae)

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ABSTRACT. *Campylandra* Baker was published in 1875. Subsequently, various authors have either united it with *Tupistra* Ker Gawler (sometimes recognizing it as a subgenus or section of *Tupistra*) or maintained it as a separate genus. The present authors regard *Campylandra* as a separate genus on account of its having filaments only proximally (vs. almost wholly in *Tupistra*) adnate to the perianth tube, anthers as high as or higher (vs. lower) than the stigma, a shorter style, and a 3-lobed (vs. peltate to mushroom-shaped) stigma; this separation is confirmed by molecular phylogenies. In preparation for the accounts of genera in the Convallariaceae for *Flora of China*, Volume 24, it is therefore necessary to transfer into *Campylandra* 12 species hitherto treated under *Tupistra*, namely: *T. annulata* H. Li & J. L. Huang, *T. chinensis* Baker, *T. delavayi* Franchet, *T. emeiensis* Z. Y. Zhu, *T. ensifolia* F. T. Wang & Tang, *T. fimbriata* Handel-Mazzetti, *T. jinshanensis* Z. L. Yang & X. G. Luo, *T. liangshanensis* Z. Y. Zhu, *T. lichuanensis* Y. K. Yang, J. K. Wu & D. T. Peng, *T. longipedunculata* F. T. Wang & S. Yun Liang, *T. verruculosa* Q. H. Chen, and *T. yunnanensis* F. T. Wang & S. Yun Liang. It is also necessary to transfer two species originally described under a related genus, *Rohdea* Roth, but later transferred to *Tupistra*: *T. tui* (F. T. Wang & Tang) F. T. Wang & S. Yun Liang (*R. tui* F. T. Wang & Tang) and *T. urotepala* (Handel-Mazzetti) F. T. Wang & Tang (*R. urotepala* Handel-Mazzetti). In addition to these transfers, *Campylandra ensifolia* is lectotypified.

The genus *Campylandra* was originally described by Baker (1875: 582) with the single species *C. aurantiaca* Baker. Baker distinguished *Campylandra* from *Tupistra* Ker Gawler on the basis of its sessile leaves, presence of staminal filaments, and a smaller stigma. On the other hand, Bentham and Hooker (1883) regarded *Campylandra* as no more than a variant of *Tupistra* with somewhat more developed filaments and a more slender style, and reduced *Campylandra* to synonymy under *Tupistra*. Later, Engler (1887, 1897), Clarke (1890), Krause (1930), Dandy (1933), Chun (1934), Hutchinson (1934), Handel-Mazzetti (1936), Hara et al. (1978), and Conran and Tamura (1998) all recognized *Campylandra* as an independent genus. They evaluated it with varying circumscriptions, but as having, for example, sessile leaves, bracts longer than the flowers, tepals frilled at the margin, anthers positioned higher than or as high as the stigma, presence of filaments and/or a small, trilobed stigma. However, Hooker (1892), Baillon (1893), Franchet (1896), Wang and Liang (1976, 1978), and Huang and Li (1990) all followed Bentham and Hooker (1883) in regarding *Campylandra* as congeneric with *Tupistra*. Among them, Franchet (1896) and Huang and Li (1990) recognized *Campylandra* at the ranks of section and subgenus, respectively.

In the forthcoming *Flora of China*, Volume 24, Liang and Tamura (in press) will treat *Campylandra* and *Tupistra* as separate genera and stress the morphological differences as follows:

Campylandra: filaments proximally adnate to perianth tube; anthers positioned as high as or higher than stigma; style usually 0–1 mm, rarely to 3.5 mm *(C. fimbriata)*; stigma small, 3-lobed.

Tupistra: filaments almost wholly adnate to perianth tube; anthers positioned lower than stigma; style 4–12 mm, cylindric; stigma peltate to mushroom-shaped, 2–7 mm in diameter, fleshy.

According to Huang and Li (1990) and Huang and Hong (1997), *Campylandra* has unimodal karyotypes, and ellipsoid or subspherical, monosulcate pollen grains with reticulate or perforate exine, whereas *Tupistra* has bimodal karyotypes (except in *T. nutans* Wallich ex Lindley: unimodal), and spherical, inaperturate pollen grains with rugulose, verrucose, or gemmate exine. Thus the separation of *Campylandra* and *Tupistra* is more or less supported by karyological and pollen morphological data, although comprehensive karyological and pollen morphological studies are needed to confirm this. The separation of the two genera has also been supported by molecular phylogenies based on both *trn*K (including *mat*K) and *rbc*L genes (Yamashita & Tamura, in press). At the present stage, we consider that separation is better than inclusion of *Campylandra* within *Tupistra.* However, the detailed relationship of species and consequent generic circumscription of *Campylandra, Gonioscypha* Baker, *Rohdea, Tricalistra* Ridley, and *Tupistra* should be reexamined in the future. In the present paper, we propose the following 14 new combinations in *Campylandra* for the treatment in *Flora of China,* Volume 24. These species were hitherto treated under *Tupistra,* but agree with *Campylandra* as defined here. Two of them were originally described under a related genus, *Rohdea* Roth, but were transferred to *Tupistra* in Wang and Liang (1978). The key to genera, generic descriptions, key to species, and specific descriptions of both *Campylandra* and *Tupistra* will be provided in the *Flora.*

Campylandra annulata (H. Li & J. L. Huang) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra annulata* H. Li & J. L. Huang, Acta Bot. Yunnan., Suppl. 3: 51. 1990. TYPE: China. Yunnan: "Cultus in Horto Botanico Kunming. Locus exactus sine cognitus," *D. Y. Xia 49* (holotype, KUN).

Campylandra chinensis (Baker) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra chinensis* Baker, Hooker's Icon. Pl. 19: t. 1867. 1889. TYPE: China. Hubei: "Patung [Badong] district," *Henry 5023* (holotype, K).

Campylandra delavayi (Franchet) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra delavayi* Franchet, Bull. Soc. Bot. France 43: 40. 1896. TYPE: China. Yunnan: "dans le bois à Outchay, près de Ta kouen," *Delavay s.n.* (syntype, P). Hubei: [without locality], *Henry 5231A* (syntype, P).

Campylandra emeiensis (Z. Y. Zhu) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra emeiensis* Z. Y. Zhu, Acta Bot. Yunnan. 4: 271. 1982. TYPE: China. Sichuan: Emei Shan, 1800–2500 m, 1 June 1976, *D. Q. Li & Z. Y. Zhu 29* (holotype, EMA).

Campylandra ensifolia (F. T. Wang & Tang) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra ensifolia* F. T. Wang & Tang, Bull. Fan Mem. Inst. Biol. 7: 86. 1936. TYPE: China. Yunnan: "Plant of 6–18 inches. Flowers brown and green, strongly fragrant. Moist shady situations amongst rocks in side valleys on hills to east of Tengyueh, Lat. 25°N., alt. 6–7000 ft.," June 1912 (fl), *G. Forrest 8455* (lectotype here designated, K).

Wang and Tang cited two syntypes: the flowering specimen cited above (as "type") and the following specimen (as "fruit type"): China. Yunnan: "Shangpa," 2000 m, 21 Oct. 1934 (fr), *H. T. Tsai 58892* (PE). The latter specimen was preserved in the herbarium of the Fan Memorial Institute of Biology, Peiping (Beijing), which has since been transferred to KUN, NAS, and PE. The specimen at Kew has two inflorescences and is here chosen as the lectotype because flowering material is more useful diagnostically than fruiting material.

Campylandra fimbriata (Handel-Mazzetti) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra fimbriata* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 59: 253. 1922. TYPE: China. Yunnan: "In pluviisilva frondosa calide temperata juxta vicum Bahan in convalle fluvii Salween, 27°58′[N]," ca. 2600 m, 20 June 1916, *Handel-Mazzetti 8804* (holotype, W).

Campylandra jinshanensis (Z. L. Yang & X. G. Luo) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra jinshanensis* Z. L. Yang & X. G. Luo, Acta Bot. Yunnan. 6: 389. 1984. TYPE: China. Sichuan: cultivated in garden of Sichuan School of Chinese Materia Medica, 450 m, 12 Apr. 1983, *X. G. Luo & Z. L. Yang 483053* (holotype, EMA).

Campylandra liangshanensis (Z. Y. Zhu) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra liangshanensis* Z. Y. Zhu, in Z. Y. Zhu & J. L. Zhang, Acta Phytotax. Sin. 19: 521. 1981. TYPE: China. Sichuan: Puge, 2500 m, 12 Nov. 1978, *D. Q. Li & Z. Y. Zhu 837* (holotype, EMA).

Campylandra lichuanensis (Y. K. Yang, J. K. Wu & D. T. Peng) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra lichuanensis* Y. K. Yang, J. K. Wu & D. T. Peng, J. Wuhan Bot. Res. 9: 40. 1991. TYPE: China. Hubei: Lichuan County, "Che-Le, San-jiao, Yi-Zu," 1100 m, 10 Apr. 1987, *D. T. Peng 0631* (holotype, CPU; isotype, LCDH).

Campylandra longipedunculata (F. T. Wang & S. Yun Liang) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra longipedunculata* F. T. Wang & S. Yun Liang, in F. T. Wang & Tang, Fl. Reipubl. Popularis Sin. 15: 249. 1978. TYPE: China. Yunnan: "Tsin-hung," *C. W. Wang 75985* (holotype, PE).

Campylandra tui (F. T. Wang & Tang) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Rohdea tui* F. T. Wang & Tang, Bull. Fan Mem. Inst. Biol. 7: 284. 1937. *Tupistra tui* (F. T. Wang & Tang) F. T. Wang & S. Yun Liang, in F. T. Wang & Tang, Fl. Reipubl. Popularis Sin. 15: 14. 1978. TYPE: China. Sichuan: "Pao-hsing Hsien [Baoxing Xian], Teng-chih-kou," 2460 m, 22 June 1933, *T. H. Tu 4256* (holotype, PE).

The holotype specimen was preserved in the herbarium of the Fan Memorial Institute of Biology, Peiping (Beijing), which has since been transferred to KUN, NAS, and PE.

Campylandra urotepala (Handel-Mazzetti) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Rohdea urotepala* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 57: 272. 1920. *Tupistra urotepala* (Handel-Mazzetti) F. T. Wang & Tang, Fl. Reipubl. Popularis Sin. 15: 14. 1978. TYPE: China. Sichuan: "in saltu profundo tergi Soso-liangdse," ca. 2700 m, 25 Apr. 1914, *Handel-Mazzetti 1733* (holotype, W).

Campylandra verruculosa (Q. H. Chen) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra verruculosa* Q. H. Chen, Acta Phytotax. Sin. 25: 69. 1987. TYPE: China. Guizhou: Pingtang, Bairu, 700 m, 13 May 1982, *Q. H. Chen & J. D. Liu 1328* (holotype, HGAS).

Campylandra yunnanensis (F. T. Wang & S. Yun Liang) M. N. Tamura, S. Yun Liang & Turland, comb. nov. Basionym: *Tupistra yunnanensis* F. T. Wang & S. Yun Liang, in F. T. Wang & Tang, Fl. Reipubl. Popularis Sin. 15: 249. 1978. TYPE: China. Yunnan: "Chao-tung," *H. T. Tsai 50880* (holotype, PE).

Acknowledgment. We thank Anthony R. Brach (MO c/o Harvard) for help in locating literature.

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A New Species of *Palicourea* (Rubiaceae, Psychotrieae) from Southern Brazil

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ABSTRACT. The new species *Palicourea australis* C. M. Taylor is described and illustrated. This new species is distinguished from *P. marcgravii* A. St.-Hilaire by its shorter corollas with dense external pubescence that is confined to the tube and corolla lobes with appendages or pronounced thickenings.

During study of Brazilian *Palicourea* Aublet for the "Phanerogamic Flora of São Paulo State" project, the following well-marked species was discovered to be undescribed, due largely to confusion in the identities of previously described species. As circumscribed by Taylor (1997), *Palicourea* is distinguished within the Rubiaceae by its persistent stipules that are united around the stems into a continuous sheath and bilobed in the interpetiolar portion; generally colored inflorescences with the flowers usually pedicellate; corollas that are usually brightly colored, usually five-lobed, and have well-developed tubes that are somewhat swollen at the base and glabrous internally except for a dense ring of pubescence situated just above this basal swelling; and drupaceous fruits with usually two pyrenes. This Neotropical genus includes about 200 species found from sea level to high montane regions. The species are typically distylous and apparently pollinated by hummingbirds.

Palicourea australis C. M. Taylor, sp. nov. TYPE: Brazil. Paraná: Mpio. Mangueirinha, Cachoeira, 6 Dec. 1989, *G. Hatschbach & V. Nicolack 53679* (holotype, MBM; isotype, MO-4224516). Figure 1.

Haec species a *Palicourea marcgravii* corollae tubo extus velutino-pubescente et lobulis incrassationes projecturasve abaxiales gerentibus distinguitur.

Flowering 0.7 m tall, to 2 m tall; stems terete, glabrous to puberulous. *Leaves* paired; blades elliptic to narrowly so, 6–17 × 2–6.5 cm, at apex acute to somewhat acuminate, at base acute to cuneate, papyraceous, adaxially and abaxially glabrous to minutely puberulous, often more densely so along costa; secondary veins 6 to 10 pairs, extending to near margins but not uniting with them, with 1(to 3) weak to well-developed intersecondary veins usually present between pairs of secondary veins, adaxially costa prominulous and remaining venation plane to a little thickened, abaxially costa prominulous to prominent, secondary veins prominulous, and reticulated minor venation sparse, plane to thickened; margins thinly to distinctly cartilaginous, minutely ciliolate; *petioles* 3–7 mm long, glabrous to puberulous; *stipules* puberulous to glabrescent, persistent at least with the leaves, united around the stem into a continuous truncate sheath 0.2–1 mm long, lobes narrowly triangular to somewhat lanceolate, 3–7 mm long, acute to acuminate or bidentate. *Inflorescences* terminal, erect, with peduncles 3.5–11.5 cm long; panicles shortly pyramidal to somewhat corymbiform, 2.5–8.5 × 3–6 cm excluding corollas, with 4 to 6 pairs of developed secondary axes, these often subopposite to alternate, with flowers pedicellate in cymules of 3 to 7; bracts entire to ciliolate, those subtending secondary axes triangular, 0.5–6 mm long, acute, those subtending pedicels deltoid to narrowly triangular, 0.3–1 mm long, acute; pedicels 1–4 mm long; peduncle, axes, bracts, and pedicels puberulous to glabrescent, red; *flowers* distylous, with hypanthium cylindrical to turbinate, ca. 1 mm long, glabrous to puberulous; *calyx* limb puberulous to usually glabrous, divided nearly to base, lobes ovate to deltoid or shortly trilobed, 0.8–1.1 mm long, acute to cuspidate, entire to laciniate; *corolla* tubular, yellow on tube and pink to purple on lobes, a little swollen at base, generally straight at base and in tube, externally densely pubescent on tube with stout trichomes 0.3–1 mm long, glabrous on lobes, internally glabrous except for a sparsely pilosulous ring ca. 1 mm wide at ca. 2 mm above base, tube 8–11 × ca. 2.5–4 mm, lobes triangular, 1.5–2 mm long, acute, thickened and shortly involute adaxially at apex, abaxially with a thickened and rounded appendage to 0.5 mm long; *anthers* in short-styled form ca. 4 mm long and partially exserted, in long-styled form ca. 3 mm long and positioned ca. ⅔ of length of corolla tube above base; *stigmas* in short-styled form ca. 2 mm long and positioned ca. ⅔ of length of corolla tube above base, in long-styled form ca. 1 mm long and exserted; disk ca. 1–1.2

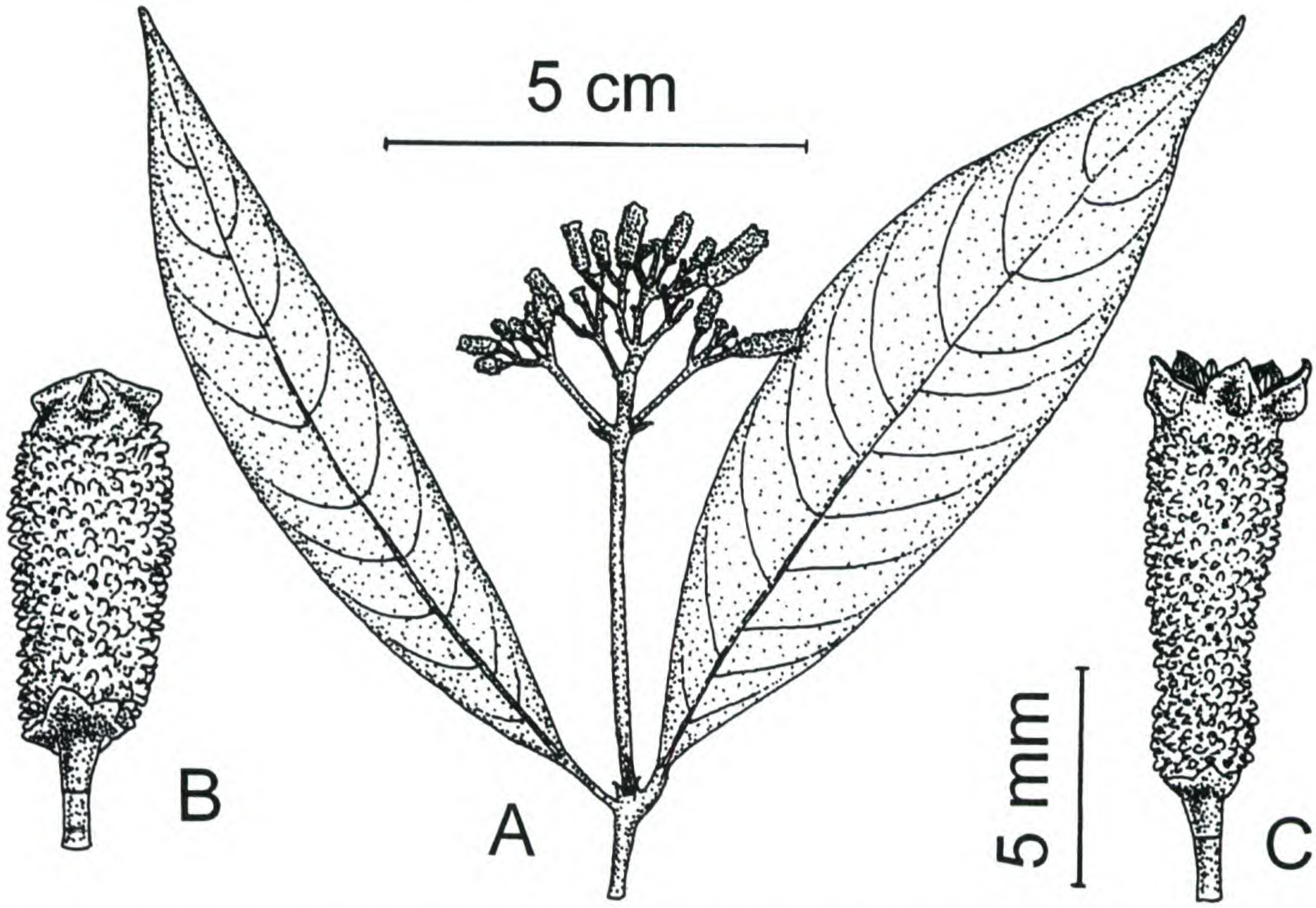

Figure 1. *Palicourea australis* C. M. Taylor, based on *Lindeman & de Haas 3796* (NY). —A. Branch with inflorescence. —B. Flower bud before anthesis. —C. Flower at anthesis. B, C to same scale.

mm high, bipartite. *Infructescences* similar to inflorescences or with axes often more spreading, color not observed; *fruit* ovoid, ca. 4.5 × 5 mm, somewhat flattened laterally, glabrous or glabrescent, red; pyrenes with 3 to 5 low rounded longitudinal ridges and the surfaces verruculose. [Subg. *Palicourea*, sect. *Crocothyrsae* Grisebach, series *Croceae* (Müller Argoviensis) K. Schum., subser. *Subcymosae* (Müller Argoviensis) C. M. Taylor.]

Distribution, phenology, and habitat. In moist *Araucaria*, pine, gallery, and lakeside forests at 700–1000 m. Collected in flower in December, January, and February, in fruit in January.

This species is distinguished by its calyx lobes, which are often laciniate or shortly trilobed, corollas that are externally densely pubescent with stout trichomes on the tube but, in contrast, glabrous on the lobes, corolla lobes with pronounced thickenings or knobs on the abaxial portion, and clearly bipartite disk. Its infrageneric classification is based on the system of Taylor (1997). This new species is similar in corolla characters to *Palicourea nitidella* (Müller Argoviensis) Standley of the Amazon basin; *P. nitidella* can be distinguished from *P. australis* by its secondary leaf veins that are arranged in 8 to 17 pairs and plane on their adaxial surfaces, petioles 5–30 mm long, calyx lobes obtuse and entire to shortly ciliolate, and corolla tubes 11–14 mm long. *Palicourea australis* and *P. nitidella* are completely allopatric in their distributions. This new species is also similar to *Palicourea marcgravii*, which is found from southern Venezuela to São Paulo and Minas Gerais States in Brazil and thus also allopatric. *Palicourea marcgravii* can be distinguished from *P. australis* by its stipule lobes 1–3 mm long; corollas that are moderately to densely puberulous to short-pilosulous on the exterior with the pubescence similar on the tube and lobes; corolla tubes 12–18 mm long; corolla lobes 2.5–3 mm long that are not thickened or appendaged abaxially; and fruits 5.5–7 × 5.5–8 mm. *Palicourea australis* has incorrectly been treated previously under the name "*Palicourea platypodina* Muell. Arg." (e.g., Smith & Downs, 1956), but that name is a synonym of *P. marcgravii* [*Glaziou 8739*, isotype of *P. platypodina*, K, photo of destroyed isotype in B (F Rockefeller neg. #623) MO]. Thus the geographic distribution given by Smith and Downs applies to the combined ranges of these two species, and is therefore inaccurate. *Palicourea australis* is one of the southernmost species of this genus, and the specific epithet refers to this southern range.

Few fruiting collections have been seen; these may have been confused with those of *Palicourea croceoides* Hamilton, which is apparently sympatric with *P. australis*. *Palicourea croceoides* is easily distinguished by its externally glabrous corollas.

In addition to the specimens listed below, two collections (*Brito 105*, R; *Anonymous s.n.*, RB-183169) that may be from Rio de Janeiro have also been seen, but neither of them has a more precise collecting locality indicated. The lack of collections of *Palicourea australis* with a clearly indicated collecting locality in this state, together with the apparent absence of this new species from São Paulo state, makes its occurrence in Rio de Janeiro State doubtful.

Paratypes. BRAZIL. **Paraná:** Palmeira, *Ceccatto & Horta Barbosa 28* (RB); Ponta Grossa (Lagoa Dourada), *Dombrowski & Neto 7838* (NY); Ponta Grossa in valle fluminensis, *Dusén 2516* (R); Serrinha, *Dusén 7305* (K), Piraquara, *Dusén 7793* (BM, NY); Desvio Ribas, *Dusén 10879* (MO); Ponta Grossa opp., *Dusén 15984* (MO); mpio. Bocaiuva do Sul, Passa Vinte, *Hatschbach 10817* (UEC); mpio. Palmeira, Fazenda Santa Amélia, *Hatschbach & Fontella 17685* (RB); São João do Triunfo, *Hatschbach 17711* (NY); mpio. São Mateus do Sul, Vargem Grande, *Hatschbach 23254* (RB); mpio. Ipiranga, Rio Capivari, *Hatschbach 25841* (NY); mpio. Contenda, Serrinha, *Hatschbach 30644* (NY); Ponta Grossa, *Hoehne s.n.* (SP-23300); mpio. São Mateus do Sul, BR-476, Km 152, *Krapovickas & Cristóbal 39664* (K); mpio. São José dos Pinhaes, *Kummrow 763* (MO); mpio. Contenda, near Contenda, 25°40′S, 49°35′W, *Landrum 2446* (NY); SE of Campo Novo, ca. 50 km W of Laranjeiras do Sul, *Lindeman & de Haas 2905* (K, WIS); ca. 12 km N of Curitiba, *Lindeman & de Haas 3796* (NY); Parque Santa Maria near Tamandaré, 15 km N of Curitiba, *Lindeman & de Haas 3981* (NY); Catanduvas-Camargopolis, *Pereira & Hatschbach 7771* (RB); Ponto Grossa, Vila Velha, Lagôa Dourada, *Pereira & Hatschbach 8117* (RB); mpio. Iratí, Floresta Nacional de Iratí, 25°30′S, 50°40′W, *Rauscher 386* (W); mpio. Ponta Grossa, Buraco do Padre, *Ribas & Cordeiro 874* (BHCB); Rio do Santo, *Schwacke 1379* (RB); São José dos Pinhais, vicinity of Curitiba, along Rte. BR-376, *Tsugaru et al. B-2359* (MO, NY). **Santa Catarina:** without locality, *Müller s.n.* (RB-40162); Rio do Bugre, Caçador, *Klein 3419* (NY); Campo Novo, Mafra, *Klein 3823* (NY); ao Leste como ao Oeste da Serra Geral, *Müller 72* (R); ao Leste da Serra Geral (Rio Mameuhas[? illeg.]), *Müller 173* (R); ERF km 145, Itaiópolis, *Reitz & Klein 11474* (NY); Marombas, Campo Novo, *Reitz & Klein 14245* (NY); Itaió, Itaiópolis, *Reitz & Klein 17374* (NY); mpio. Lajes, between Palmeiras and Lajes, *Smith & Klein 8071* (NY, R); mpio. Papanduva, N of the Serra Geral on Estrada de Rodagem Federal Km 178 ERF, *Smith & Klein 8404* (K, NY); mpio. Campo Erê, 6 km W of Campo Erê, 26°22′S, 53°06′W, *Smith & Klein 13714* (R); mpio. Catanduvas, 17–19 km W of Joaçaba, ca. 27°03′S, 54°45′W, *Smith & Klein 13942* (MO, WIS); mpio. Ponte Serrado, near Ponte Serrado, 94 km W of Joaçaba, 26°52′S, 52°05′W, *Smith & Klein 14006* (NY); mpio. Água Doce, 18 km S of Rio Chapecó, *Smith et al. 15710* (NY); São Bento do Sul, estrada para Corupá, 26°15′19.7‟S, 49°26′31.1‟W, *Stehmann et al. 1725* (BHCB, UEC).

Acknowledgments. I thank R. E. Gereau for preparation of the Latin diagnosis; the curators of IAC, NY, R, RB, SP, and US and D. Zappi of K for loan of specimens; the "Phanerogamic Flora of São Paulo State" project and the FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo) for logistical help and support for travel to Brazil; J. H. Kirkbride, Jr., G. Hatschbach, and D. Zappi for advice and information; and in particular S. L. Jung-Mendaçolli for encouragement and invaluable help in the study of *Palicourea* in southeastern Brazil.

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Galvezia leucantha subsp. *porphyrantha* (Scrophulariaceae), a New Shrub Snapdragon Endemic to Santiago Island, Galapagos, Ecuador

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ABSTRACT. We describe a distinctive subspecies of *Galvezia leucantha* from the island of Santiago (San Salvador), Galapagos, Ecuador. The new subspecies, *Galvezia leucantha* subsp. *porphyrantha* Tye & H. Jäger, is distinguished principally by its purple flowers and lack of pubescence. All three subspecies, and the species as a whole, have small and in some cases declining populations restricted to eroded scoria cliffs, and are considered Critically Endangered (CR) by IUCN criteria.

RESUMEN. Describimos una subespecie distintiva de *Galvezia leucantha* de la Isla Santiago (San Salvador), Galápagos, Ecuador. La nueva subespecie, *Galvezia leucantha* subsp. *porphyrantha* Tye & H. Jäger, se distingue principalmente por sus flores purpúreas y su falta de pubescencia. Las tres subespecies, y la especie en sí, tienen poblaciones pequeñas, en ciertos casos en declinación, restringidas a acantilados de escoria erosionados, y se consideran En Peligro Crítico de Extinción (CR) según los criterios de la UICN.

The genus *Galvezia* Dombey (Scrophulariaceae: Antirrhineae) comprises five species of the arid coastal zone of Peru, continental Ecuador, and the Galapagos Islands (Elisens, 1989, 1992). The single Galapagos species, the Galapagos Shrub Snapdragon, *G. leucantha* Wiggins (1968), is endemic to the islands, occurring in restricted cliff habitats. It has a distinct floral morphology and pollination biology when compared with its red-flowered, hummingbird-pollinated mainland relatives. Elisens (1989) drew attention to the paler flowers and shorter corolla tube of *G. leucantha.* Wiggins (1968) suggested that the white flower of the Galapagos species was pollinated by nocturnal moths or butterflies, although Elisens (1989) reported pollination by the endemic carpenter bee *Xylocopa darwini.*

Two subspecies of *G. leucantha* have so far been formally recognized: *Galvezia leucantha* subsp. *leucantha* of the western Galapagos islands Isabela and Fernandina, and *Galvezia leucantha* subsp. *pubescens* Wiggins (1968) on Rábida Island. *Galvezia leucantha* subsp. *leucantha* has white flowers and largely glabrous stems, leaves, pedicels, and calyces, while *Galvezia leucantha* subsp. *pubescens* was differentiated by the pink interior of the corolla and densely glandular-puberulent young twigs, leaves, pedicels, and calyces (Wiggins, 1968; see also Wiggins & Porter, 1971). *Galvezia leucantha* subsp. *pubescens* was also reported to have shorter pedicels, and to be dimorphic in flower color (Elisens, 1989), confirming the statement in Wiggins and Porter (1971) that the interior of the corolla is "sometimes" reddish or pink.

In addition to the two named subspecies, Elisens (1989) recognized a third, unnamed form from Santiago (San Salvador) Island. Two populations from Santiago, on old red hills in recent black lava flows, were studied by Elisens (1989): one at James Bay (west coast) and the other behind Bahía Ladilla (southwest coast). Elisens compared several characters between the populations on Santiago (two), Rábida, Isabela (two), and Fernandina. He also examined isozyme variation at 26 loci, of which 24 were invariant among all six populations, and the other two had only two alleles each, with variation present in only one population (Rábida and James Bay) for each of these two loci. Further, the two populations with polymorphic loci contained few heterozygotes. This lack of genetic variability has been found in other Galapagos endemic plants (Rick & Fobes, 1975; D. Anderson, pers. comm. 1999), as in other radiative groups on oceanic islands (e.g., Lowrey & Crawford, 1985; Crawford et al., 1987; T. Lowrey, pers. comm. 1999).

Compared with the lack of intrapopulation variation in genetic and morphological characters, interpopulation morphological variation is marked and consistent (Elisens, 1989), which probably reflects founder effects and genetic drift in the very small populations (mostly fewer than 50 plants).

Recent fieldwork on Santiago Island has enabled the re-examination of the populations previously studied by Elisens (1989), as well as another population in the east-central part of the island. The new material confirms the distinctiveness of the Santiago populations, which we name:

Galvezia leucantha subsp. **porphyrantha** Tye & H. Jäger, subsp. nov. TYPE: Ecuador. Galapagos, Santiago Island: red hill in Bahía Ladilla, 0°18′5″S, 90°49′40″W, 13 Nov. 1998, *H. Jäger & A. Tye, CDRS 9338* (holotype, CAS; isotypes, CAS, CDS).

Haec subspecies a subsp. *leucantha* corolla extus magentea, intus striis roseis albisque ornata atque corollae labii superioris lobulis apice albis differt.

Shrub, much branched at base, with branches suberect, horizontal to (on cliffs) pendent, to 1.5 m long. Leaves opposite, blades up to 5 × 5.2 cm, elliptic-lanceolate to ovate-lanceolate, broadly cuneate to rounded at base, acute at apex, entire, bright green, glabrous, occasionally sparsely puberulent; petioles 5–7 mm long. Flowers axillary. Pedicels slender, 10–17 mm but lengthening to 25 mm in fruit, glabrous, spreading-ascending, bent abruptly at apex; calyx with cup of fused basal part of sepals delineated from sepal lobes by groove, lobes acute to obtuse, 1.5–2.5 mm long, glabrous, but slightly puberulent along margins; corolla 6.5–12.5 mm long, outside puberulent, reddish purple, inside irregularly striated pink and white, tips of superior petal lobes white, corolla tube 4.5–6.5 × 1.5 mm, slightly ampliate, the limb bilabiate, superior lip 2–5.5 mm, bilobed about halfway to base, lobes cucullate to spreading-ascending, puberulent, lower lip trilobate, 1.5–4 mm long, base of lower lip folded, glandular-puberulent, sinuses between lobes ca. 2 mm deep, central lobe cucullate; posterior pair of stamens ca. 5 mm long, filaments glabrous; anterior stamen pair longer, ca. 7 mm, filaments glabrous distally, glandular-papillate basally; anthers ca. 1 mm long; fifth stamen sterile, inserted ca. 1.5 mm above base of tube, ca. 2 mm long; capsules subglobose, 3–5 mm long; seeds 0.5–0.7 mm long, subtruncate, with 4 to 7 cristate-echinate longitudinal ridges, black. A photograph of the flower of the new subspecies appears in Elisens (1989: fig. 1).

We assign this form the rank of subspecies, since it is a morphologically recognizable and well-defined form, and occurs in a geographical area allopatric with the other forms.

Etymology. We choose the name *porphyrantha* to correspond with the descriptive names of the other taxa, and based on the most obvious difference from them. The full name of the subspecies is thus the purple-flowered, white-flowered *Galvezia.*

Discussion

Holotype. This specimen bears the original specimen number *CDRS 9338B* assigned by the Herbarium of the Charles Darwin Research Station (CDS), before being deposited at the California Academy of Sciences (CAS). It is a fertile specimen bearing flowers and fruit, but it does not show the full range of variation in leaf size, with most leaves being small.

Isotypes. 1. Original CDS number *CDRS 9338C,* deposited at CAS. This specimen is from the same plant as the holotype, and is a branch with copious foliage but no flowers. Collection details are as for the holotype. 2. *CDRS 9338A,* deposited at CDS. This is a fertile branch bearing fruit, from the same plant as the holotype. Collection details are as for the holotype.

Paratypes. All paratype specimens are deposited at CDS. ECUADOR. **Galapagos, Santiago Island:** Bahía Ladilla, 28 June 1999, *A. Tye CDRS 9464*; James Bay, 11 Nov. 1998, *H. Jäger & A. Tye CDRS 9337A, 9337B*; James Bay, 2 Oct. 1995, *A. Mauchamp CDRS 6840*; crater in Zona D, 25 Feb. 1996, *I. Aldaz CDRS 6896A, 6896B.*

Characteristics of the three subspecies are compared in Table 1. The foliage, young twigs, pedicels, and calyces of all populations of *Galvezia leucantha* subsp. *porphyrantha* are glabrous or only sparsely pubescent, as in *Galvezia leucantha* subsp. *leucantha,* and unlike *Galvezia leucantha* subsp. *pubescens.* The flowers in all Santiago populations of the new subspecies are externally magenta, with white seen only on the superior lobes, and internally striated pink and white, as seen in the photograph presented by Elisens (1989: fig. 1).

Some other apparent differences between subspecies have been suggested, based on the few collections then available, which do not appear to be supported by the current larger collections including the new material. Leaf size does not reliably permit discrimination between subspecies: although the leaves of *Galvezia leucantha* subsp. *porphyrantha* are larger in some specimens than the largest mentioned by Wiggins and Porter (1971) for *Galvezia leucantha* subsp. *leucantha,* leaves as large as this were found in material from Isabela (Wiggins, 1968). Pedicels of all subspecies appear quite variable in length (Table 1), obscuring the differences that were suggested by Elisens (1989)

Table 1. Characteristics of three subspecies of *Galvezia leucantha*. Data are from Wiggins (1968) (W), Wiggins & Porter (1971) (WP: only for characters that differ from W), Elisens (1989) (E), and the current study (T). For flower measurements listed under "T" (made by AT), sample sizes are: *G. leucantha* subsp. *leucantha* n = 6 (4 from Isabela, 2 from Fernandina); *G. leucantha* subsp. *porphyrantha* n = 4; *G. leucantha* subsp. *pubescens* n = 4.

	subsp. *leucantha*, Isabela and Fernandina	subsp. *porphyrantha*, Santiago	subsp. *pubescens*, Rábida
Pubescence	None to sparse (W, E, T)	None to sparse (E, T)	Dense, glandular (W, E, T)
Corolla	White (W, E, T)	White, with violet on "upper two fused petals" (p. 102) or "tube" (p. 103, photo p. 99) (E) Externally magenta (all petals), with tips of superior lobes white (T)	White, inside sometimes reddish or pink (WP). Dimorphic: most white, very rarely violet-tinged (E, T)
Pedicel length (mm, in flower)	8–12 (W) 13–24 (E) 14–23 (Isabela) (T) 8–14 (Fernandina) (T)	12.5–14 (E) 10–17 (T)	10–12.5 (E) 10–17 (T)
Sepal length (mm)	4–6 (W) 2–3 (T)	1.5–2.5 (T)	2–2.5 (T)
Corolla length (mm)	10–12 (WP*) 7.5–9 (T)	6.5–12.5 (T)	8–9 (T)
Corolla tube length (mm)	5.5–6.5 (E) 8–10 (W) 4.5–5 (T)	5.5.–6.5 (E) 4.5–6.5 (T)	5–5.5 (E) 4–5 (T)
Superior corolla lip length (mm)	5–6 (W) 3–3.5 (WP*) 2–4 (T)	2–5.5 (T)	3–4 (T)
Inferior corolla lip length (mm)	2 (W) 3.5–4 (WP*) 1.5–2.5 (T)	1.5–4 (T)	2.5–3 (T)

* Characters given by WP for *G. leucantha* subsp. *leucantha* may include specimens of subspecies *porphyrantha*. In addition to the Santiago material quoted above, data for the other subspecies under "T" in this table are from specimens in CDS.

to exist between populations. The sepals of *Galvezia leucantha* subsp. *leucantha* appear to be shorter than recorded by Wiggins (1968) and Wiggins and Porter (1971). They are not as different from the presumed ancestral *G. fruticosa* Gmelin as suggested by Wiggins (1968), and there is no significant difference between Galapagos populations. The major point arising from the flower measurements in Table 1 is that, despite earlier suggestions of differences, the populations from all islands seem more or less similar with respect to the size of both leaves and flowers. All flower measurements are based on small samples, and the differences between subspecies and populations are not statistically significant. The corolla of the Santiago subspecies, when fully open, may average longer than that of most other populations, but further data would be required to confirm this. If so, then the new subspecies would most closely resemble mainland *Galvezia*, with their long, tubular, red corollas, in both flower color and form.

Key to the Three Subspecies of *Galvezia leucantha*

1a. Dense, glandular pubescence on young branches, pedicels, and calyces . . . . . *G. leucantha* subsp. *pubescens* (Rábida Island)

1b. Pubescence none or sparse.

2a. Flowers white . . . . . *G. leucantha* subsp. *leucantha* (Isabela, Fernandina)

2b. Flowers reddish purple . . . . . *G. leucantha* subsp. *porphyrantha* (Santiago)

Evolution

Most *Galvezia* have long, tubular, red flowers adapted for hummingbird pollination (Elisens & Freeman, 1988). Elisens (1989) suggested that, despite the greater age of Rábida island, the Santiago populations, being morphologically closest to mainland relatives, may be older, with the whiter-flowered populations on the western Galapagos islands and Rábida being derived. The color of the flowers of the three subspecies of *G. leucantha* suggests an evolutionary and geographic progression from a sin-

gle colonization event, which perhaps initially established a now-extinct population on an eastern island (in support of Elisens, 1992). Divergence may have occurred from the original founder population, in two different directions on Santiago and Rábida, since the pubescence of the Rábida population is more similar to the state in mainland *G. fruticosa*, whereas the Santiago subspecies is most similar to mainland species in flower color and possibly floral structure. Both of these subspecies thus retain primitive but different characteristics. Populations furthest from the mainland (on the youngest islands) have diverged the most from the pubescent, red-flowered, mainland taxa, having both glabrous foliage and the palest, white flowers.

Galvezia leucantha has floral nectar characteristic of hummingbird-pollinated flowers, according to Elisens and Freeman (1988). This may not indicate a particularly recent origin for the species. Most other bee-pollinated relatives of *Galvezia* also have nectar characteristic of hummingbird-pollinated flowers (Elisens & Freeman, 1988) rather implying that nectar sugar composition is relatively invariant in the South American Antirrhininae. Elisens (1989) further showed that *G. leucantha* was self-compatible, although cross-pollination within and between populations gave higher levels of seed set. Although self-compatibility is common in island floras, it is, in the case of *Galvezia*, probably a primitive condition of the genus, as its mainland relatives are also self-compatible (Elisens, 1989).

Conservation

Given its restricted habitat, which comprises eroding, scoria cliffs that are the weathered remnants of comparatively old formations, and its presence on only four islands, the species is and always will be naturally rare. However, since the discovery of Galapagos almost 500 years ago, the plant has come under threat from introduced species, primarily large mammalian herbivores. Fernandina and Rábida islands are currently free of such animals. Fernandina has never had them, and the few goats that were present on Rábida in the 1970s were finally eradicated in 1977. Even though *Galvezia leucantha* has probably always been restricted to scoria cliffs, it may have been more common and widely distributed on Santiago and Isabela in the past. Both of these islands now have large populations of goats and donkeys, and *Galvezia* is now found virtually exclusively on those parts of the cliffs that are out of the reach of such animals. On these islands it is absent from gentler scoria slopes similar to those on which it occurs on Rábida. The species is also at risk from volcanic eruption, and it is likely that suitable habitat, at least on Santiago and possibly also on Fernandina and Isabela, may have been reduced by new lava flows in the last 200 years.

The Santiago populations are all small. In April 1999 there were about 50 plants at Bahía Ladilla and one plant at the unnamed crater in "Zona D." The site at James Bay consists of two old red cinder hills surrounded by a more recent black lava flow. In December 1999, the James Bay population comprised about 80 plants (including seedlings): the larger hill supported about 70, with the remaining 10 on the smaller. The larger hill is also the site of two plants of the Critically Endangered Santiago endemic *Scalesia atractyloides* Arnott var. *atractyloides* (Asteraceae), for which this appears to be the only remaining site. Following the discovery of these two plants, most of the hill, including the cliffs on which the *Galvezia* and *Scalesia* taxa are found, was surrounded by a goat-proof fence, in December 1998. This may permit expansion of the *Galvezia* population and should at least reduce its risk of disappearance. The site at Bahía Ladilla is similar, and formerly carried a small population of *Scalesia atractyloides*. The latter is now extinct there, although plants from that population are in cultivation at the Copenhagen Botanical Garden (O. Hamann & H. Adsersen, pers. comm. 1999). The *Galvezia* population is at present unprotected except by its ability to grow on vertical cliffs out of the reach of goats. The third population, at Zona D, is in a small crater, of old red scoria layered with basalt, where the only two known remaining plants of the other variety of *Scalesia atractyloides*, var. *darwinii* (Hooker f.) Eliasson, are also found. This site was fenced in 1997, which may enable the populations of these two species there to increase.

The critically small size of all populations of *G. leucantha*, and the recent reduction of the populations on Isabela and Santiago (Elisens, 1989, pers. obs.), result in the species as a whole meriting the IUCN (1994) classification Critically Endangered (= CR), by criterion C2a. *Galvezia leucantha* subsp. *pubescens* of Rábida is under no current grazing threat but qualifies as CR (D) by virtue of its tiny population (ca. 36 plants in December 1999, A. Tye pers. obs.), *Galvezia leucantha* subsp. *leucantha* qualifies as CR (B1, B2c, B2e) as it is under severe threat from goats and donkeys on Isabela, while *Galvezia leucantha* subsp. *porphyrantha* qualifies as CR (B1, B2c, B2e, C2a) given its recent declines.

Acknowledgments. Ana Mireya Guerrero congenially assisted with the fieldwork on Santiago. We thank Wayne Elisens and Conley McMullen for encouraging us to publish this note, and Kerry Berringer, Victoria Hollowell, Conley McMullen, and another reviewer for comments on a draft. Wayne Elisens kindly provided literature and comments, Karl Campbell gave us information on goats on Rábida, and Iván Aldaz provided information on the status of the *Galvezia* population at Zona D. Fieldwork was financed by the Frankfurt Zoological Society and the British Government's Darwin Initiative for Biodiversity Conservation. This paper is contribution number 563 of the Charles Darwin Research Station.

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Raphionacme sylvicola (Apocynaceae, Periplocoideae), a New Species from Zambia

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ABSTRACT. *Raphionacme sylvicola* is recognized by its climbing habit, long-petioled leaves that are large, soft, and thin-textured, and flowers with trisegmented corona lobes. The central coronal segment is strap-shaped and bifid, with the lateral segments subulate and fused to the filament bases. *Raphionacme sylvicola* resembles *R. monteiroae* (Oliver) N. E. Brown and *R. flanaganii* Schlechter in the climbing habit and flowers. *Raphionacme* is the largest genus in the Periplocoideae and consists of geophytic herbs with a few climbers that inhabit savanna, grassland, and semi-desert scrub. The occurrence of this new climbing species in mesophytic forest is thus uncommon and noteworthy.

During a recent visit to the Kew Herbarium (K), the first author found a specimen that resembled *Raphionacme* Harvey in floral structure, but it could not be identified as belonging to one of the known species. This specimen was collected by a MO team in northern Zambia. What makes the specimen unique is its uncommon habit and habitat.

Raphionacme is a large genus, and the majority of its species are herbaceous geophytes from drier habitats such as semi-desert scrub, savanna, and grassland. Only a few species are climbers, but none exhibit the soft, thin-textured leaves of the new species, *R. sylvicola*, which was collected in a forest, probably wet, near a waterfall. Although it shows relationship to the other climbers by its habit, it remains a unique *Raphionacme* species, particularly by its leaves and the structure of the corona in the flower.

Raphionacme, with 37 species, is the largest genus in the Periplocoideae; it is widespread over Africa and has one species in Arabia. As can be expected, such a large genus is rather polymorphic and is adapted to a variety of environmental conditions in savanna, grassland, and dry scrubland. This new species represents a new niche, namely the mesophytic forest, for the genus and contributes to our knowledge concerning the survival strategies of *Raphionacme*. The epithet "*sylvicola*" means "inhabitant of woods."

MATERIAL AND METHODS

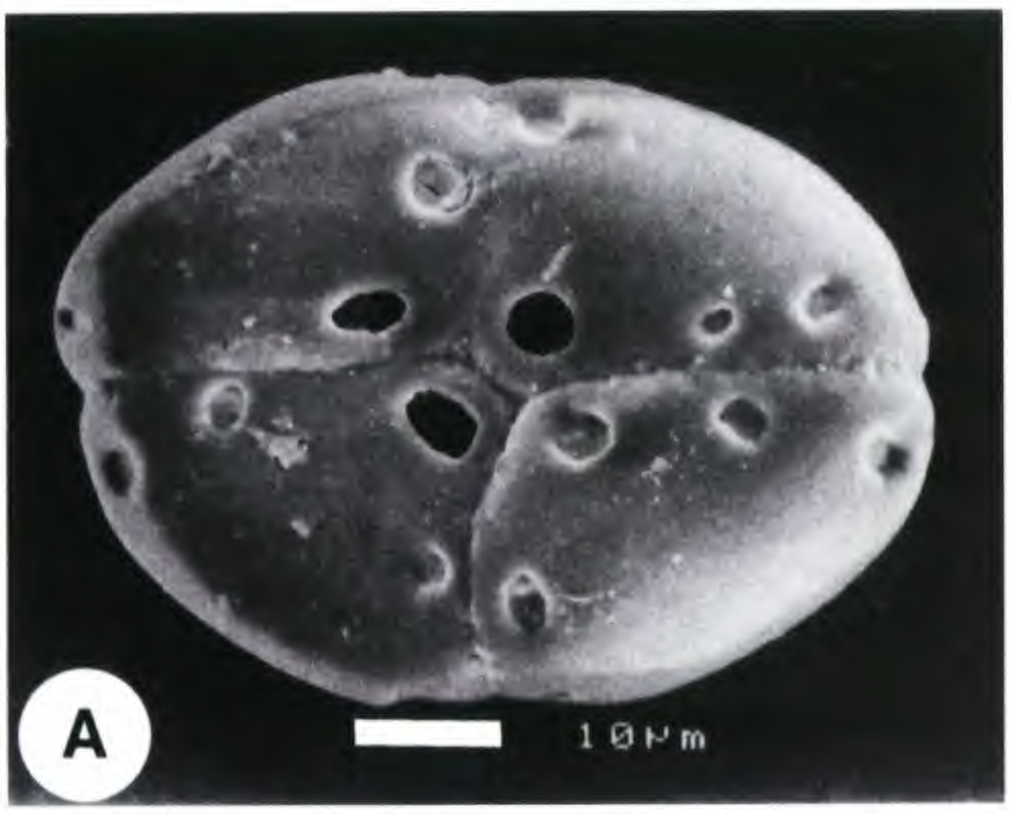
An Olympus Stereo Microscope was used to study the external morphology of the new species. As no fresh, or spirit, material was available, one flower from each of the two *Merello et al. 962* (K, MO) specimens was rehydrated and examined. For light microscopy (LM), pollen from these flowers was acetolyzed according to Erdtman's (1960) method, mounted in glycerine jelly, and sealed with paraffin wax. Samples were examined using a Zeiss photomicroscope. All measurements were made with the light microscope. For scanning electron microscopy (SEM), pollen was acetolyzed, air-dried on stubs, coated with gold, and examined under a Jeol Winsem 6400 microscope at 10 kV. For transmission electron microscopy (TEM), the rehydrated pollen was fixed in 1% osmium tetroxide, stained with 0.5% uranyl acetate, dehydrated in ethyl alcohol, and embedded in Spurr's low-viscosity resin. Sections were cut with a glass knife, stained with uranyl acetate followed by lead citrate, and examined with a Philips CM 100 microscope at 60 kV.

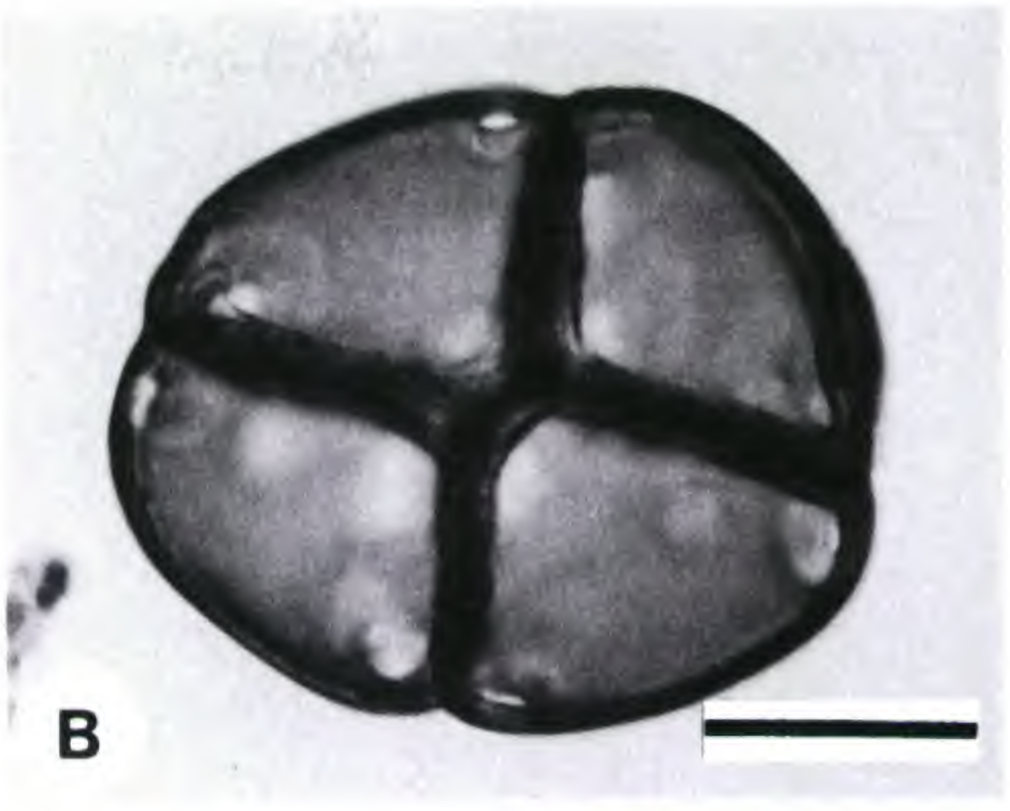
RESULTS

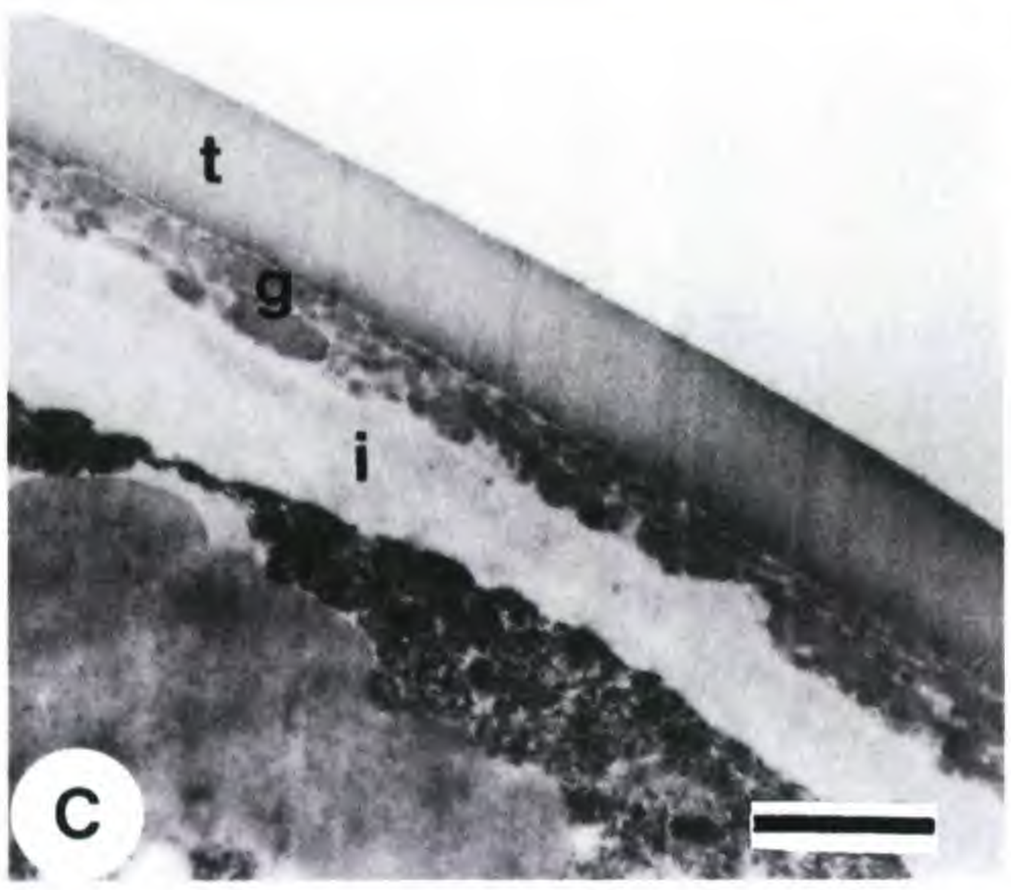
POLLEN

The most common tetrad arrangement is rhomboidal (Fig. 1A, B), but tetragonal and decussate arrangements also occur. The rhomboidal tetrads vary from 70 to 85 (length) × 56–73 (width) μm with an average of 77 × 63 μm. Individual tetrad grains have 8–14 pores.

The pollen wall is typical of that of the other *Raphionacme* species (Verhoeven & Venter, 1988). The exine is smooth and consists of an outer distal stratum (tectum) subtended by a granular stratum consisting of granules of unequal size (Fig. 1C). The inner walls separating the individual grains of the tetrad have the same structure as the exterior wall. Wall bridges (Fig. 1D, arrowhead) consisting of in-







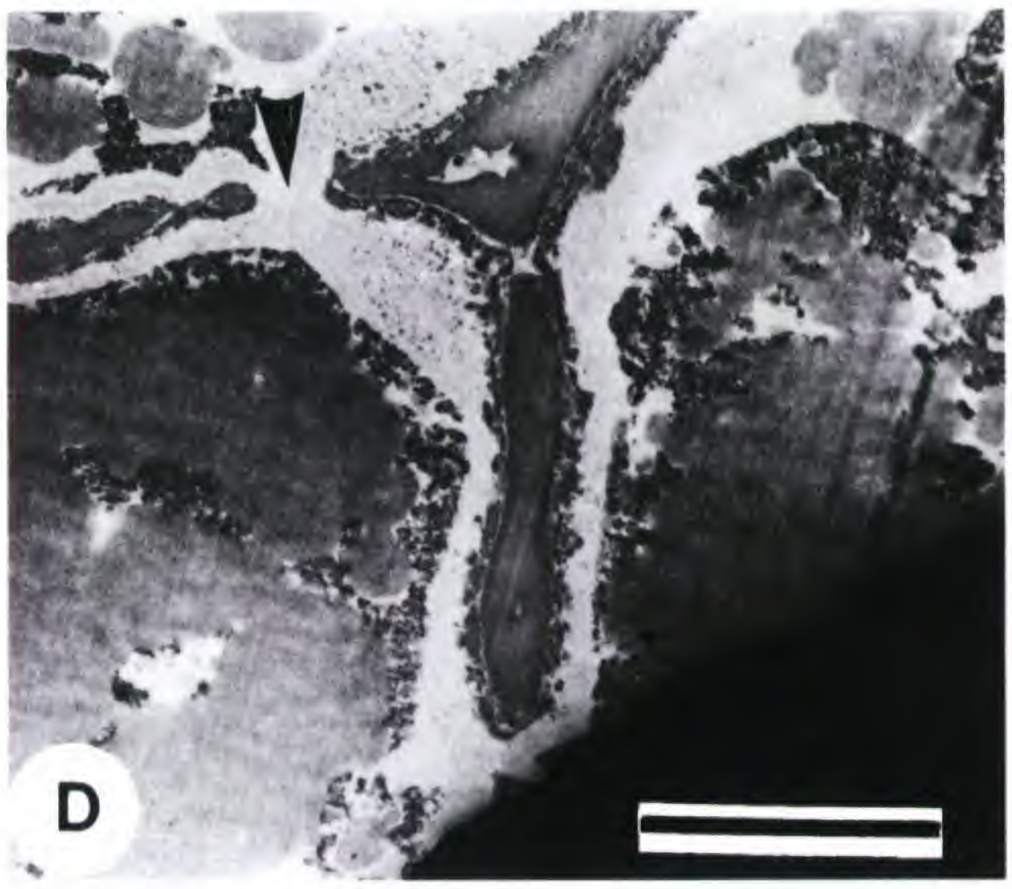


Figure 1. *Raphionacme sylvicola* Venter & R. L. Verhoeven. —A. Rhomboidal tetrad (SEM). —B. Rhomboidal tetrad (LM). —C. Section of pollen wall showing the tectum (t), granular stratum (g), and intine (i). —D. Inner wall, with wall bridges (arrowhead), consisting of granular stratum and intine. Scale bars: 1A = 10 µm, 1B = 50 µm, 1C = 1 µm, 1D = 5 µm. All from *Merello et al. 962* (MO).

tine and granular stratum occur between adjacent grains. The intine is well developed.

LEAF ANATOMY

The leaves are dorsiventral and hypostomatic with radiating striae around stomata (Fig. 2A). The cuticle on the adaxial epidermis is randomly oriented with striae running across anticlinal walls (Fig. 2B). Trichomes (Fig. 2C, D) are multicellular and appear on both leaf surfaces.

Although thin, the leaves did not rehydrate well, resulting in sections of poor quality. However, it is clear from these sections that the leaves are dorsiventral with a single palisade layer, comparable to that found in *Raphionacme flanaganii* Schlechter, *R. galpinii* Schlechter, *R. monteiroae* (Oliver) N. E. Brown, and *R. procumbens* Schlechter from moister savanna and grasslands. Isobilateral leaves occur in species such as *R. lanceolata* Schinz, *R. velutina* Schlechter, and *R. zeyheri* Harvey from more arid habitats.

TAXONOMY

Raphionacme sylvicola Venter & R. L. Verhoeven, sp. nov. TYPE: Zambia. Kaputa Region, Nsumbu (Sumbu) National Forest, Nkamba Bay Valley Area (08°36′S, 30°29′E), *Mary Merello, D. K. Harder, C. N. Nkhoma & M. Mulimo 962* (holotype, MO; isotype, K).

Haec species habitu scandente et aliquanto structura florali *R. monteiroae* et *R. flanaganii* similis, sed ab eis foliis mesophyticis mollibus atque coronae lobulorum trisegmentatorum segmento centrali loriformi profunde bifido differt.

A climber. *Roots* unknown. *Stems* woody, twining; bark pale brown, pubescent. *Leaves* petiolate; petiole 2–3 cm long, slender, pubescent, with a few reddish dentate colleters on adaxial side, with interpetiolar ridges and reddish, dentate axillary colleters; lamina ovate to elliptic, (9–)11–13 × 4.5–6.5 cm, apex acuminate, base cuneate, green above, somewhat paler green below, herbaceous and thin-textured, midrib conspicuous, lateral

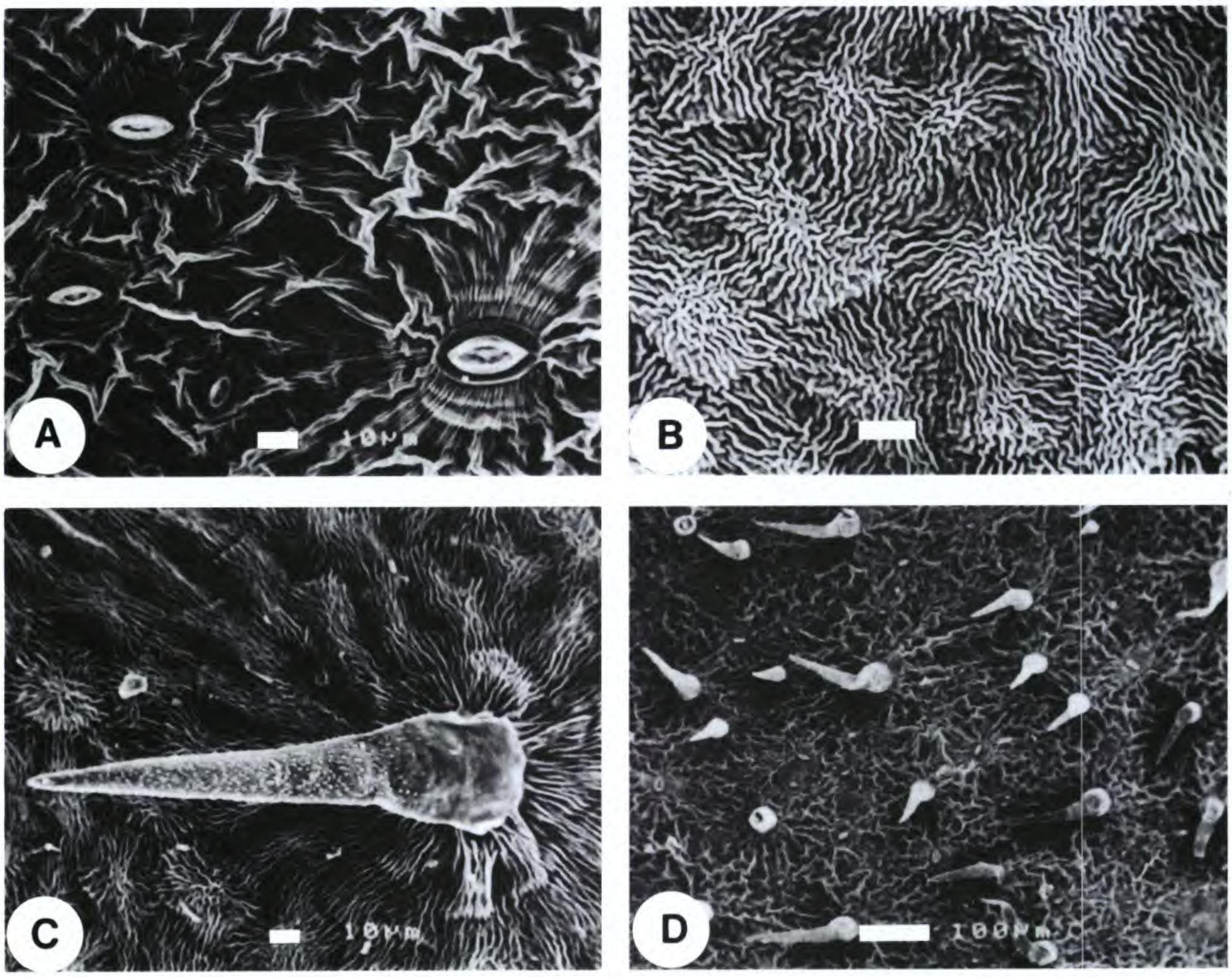


Figure 2. *Raphionacme sylvicola.*—A. Abaxial epidermis showing radiating striae around the stomata. —B. Adaxial epidermis with randomly oriented cuticle striae. —C. Multicellular trichome on adaxial epidermis. —D. Pubescent abaxial epidermis. Scale bars: 2A–C = 10 µm, D = 100 µm. All from *Merello et al. 962* (MO).

veins looping toward apex, 7 to 10 per side. *Inflorescences* axillary and subterminal, 5- to 8-flowered, pubescent; peduncles slender, 1.5–3.5 cm long; pedicels 8–12 mm long, slender; bracts narrowly ovate, 2 × 1 mm, apex acuminate, membranous, margins fimbriate. *Buds* with tube funnel-shaped, upper part ovoid, lobes contorted to the left. *Flowers* with gynostegium exserted from the corolla mouth. *Sepals* free, ovate to triangular, 1.5 × 1 mm, apex acuminate, membranous, pubescent. *Corolla* with lower annular tube around ovary; upper tube distinct, funnel-shaped, 3 mm long, glabrous; lobes oblong-ovate, 4–5 × 1.5–2 mm, apex obtuse, outside sparsely pubescent, inside glabrous. *Corona* arising from upper corolla tube mouth, antisepalous, trisegmented; central segment strap-shaped with apex deeply bifid, 8 mm long, glabrous; lateral segments inside central segment, fused laterally to filament bases, subulate, 1 mm long. *Stamens* free, glabrous; filaments filiform, 1 mm long, fused to inner base of corona lobes; anthers basally fused with stigmatic head, free from one another, ovate with apiculate apices connivent over stigmatic head; pollen in tetrads. *Nectaries* interstaminal, from apex of lower corolla tube, shelf-like, greenish. *Ovaries* 2, free, semi-inferior, many-ovuled; styles basally free, fused toward stigmatic head, ca. 2 mm long; stigmatic head pentangular ovoid; pollen translators arising from upper surface of stigmatic head, alternating with anthers, spathulate with receptacle broadly ovate, stipe terete, viscidium sub-discoid. *Follicles* and *seed* unknown. Figures 3 and 4.

Distribution and ecology. *Raphionacme sylvicola* was found climbing in forest vegetation around a steep, rocky waterfall at an altitude of ca. 915 m. The Nsumbu (or Sumbu) National Park falls within the Itigi deciduous thicket, which is a smaller unit of the wetter Zambezian miombo woodland (White, 1983). The collectors regarded *R. sylvicola*, which was collected in December, as "uncommon."

Discussion

Raphionacme sylvicola is similar to *R. monteiroae* and *R. flanaganii* in the climbing habit, and to a certain extent in floral structure. However, the new species differs in having soft mesophytic

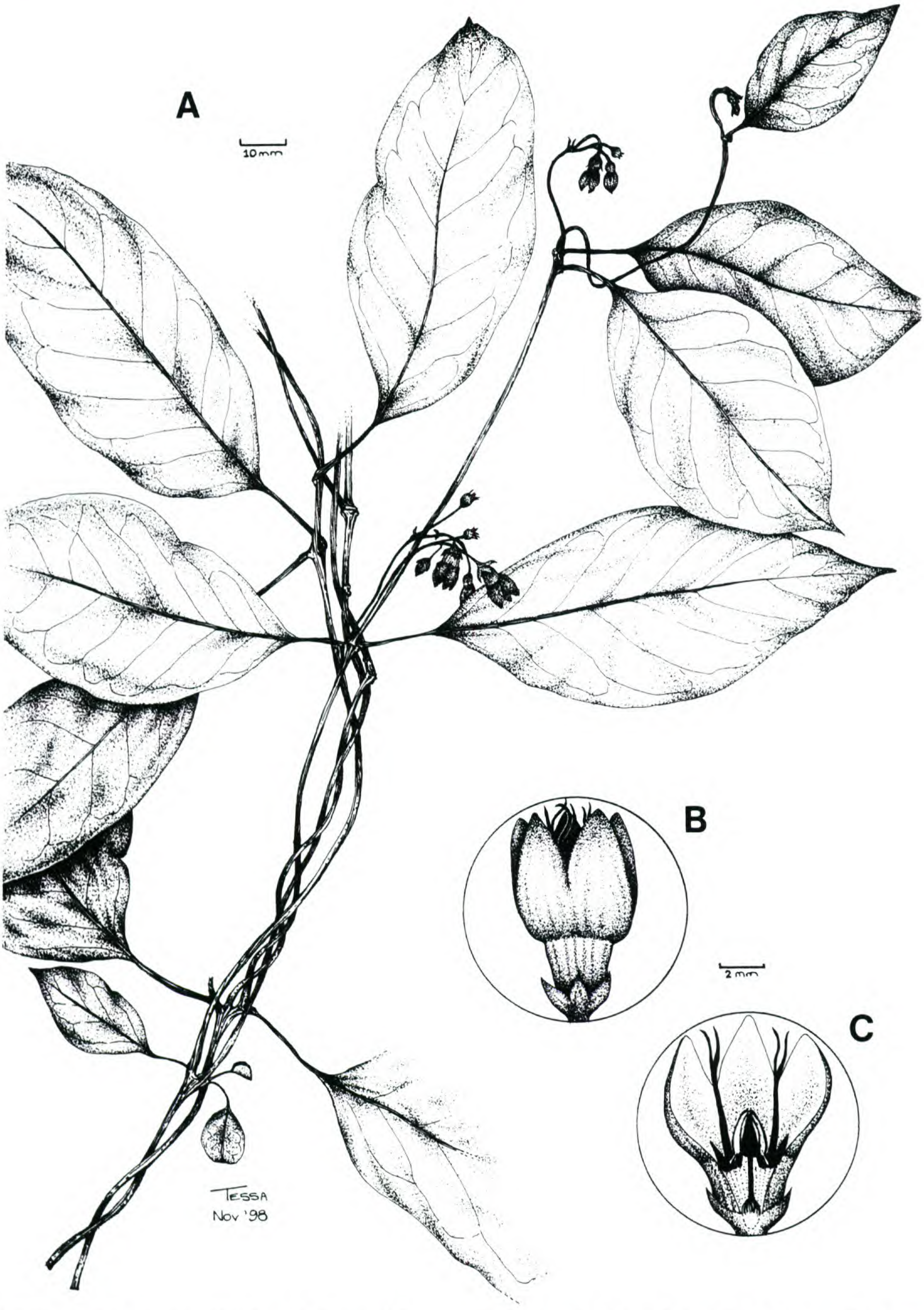


Figure 3. *Raphionacme sylvicola.*—A. Stem with leaves and flowers. —B. External view of the flower. —C. Flower opened showing pistil, stamens, and corona lobes. All from *Merello et al. 962* (K).

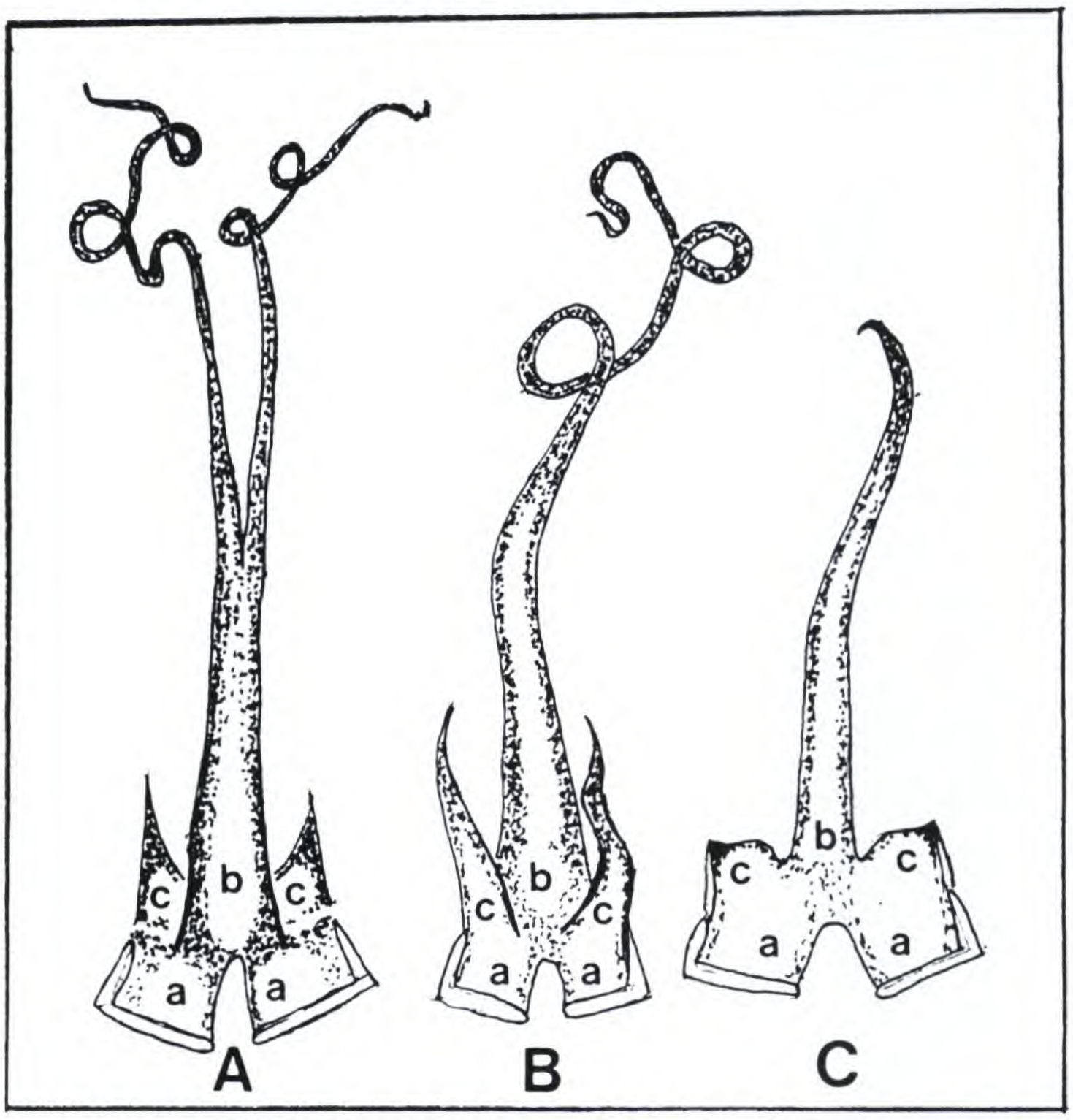


Figure 4. Structure of corona lobes of *R. sylvicola* (A), *R. flanaganii* (B), and *R. monteiroae* (C) (a: petal stubs, b: central segment, and c: lateral segments of one corona lobe). (A: *Merello et al. 962* (K), B: *Nichols 190* (BLFU), C: *Venter UNIN-6839* (UNIN).)

leaves and in the form of the corona lobes. *Raphionacme sylvicola* can be discerned by its climbing habit, its large, thin, pubescent leaves, and its trisegmented corona lobes of which the central segment is strap-shaped and deeply bifid.

Raphionacme sylvicola belongs to the group of about 20 *Raphionacme* species that exhibit trisegmented corona lobes. However, these trisegmented corona lobes vary quite extensively. The most common segmentation is the *R. globosa* type, in which the central segment is long and filiform and the lateral segments short and subulate and fused laterally to the central segment. The less common *R. flanaganii* type (Fig. 4B) has a long filiform central segment with the two lateral segments curved corniculate and outside the central segment. In the rare *R. monteiroae* type (Fig. 4C) the central segment is shorter and the lateral segments fused with the corolla lobes' bases forming sinus pockets. *Raphionacme sylvicola* (Fig. 4A) is unique in having the central segment strap-shaped and bifid, with the two lateral segments inside the central segment and these fused to the filament bases instead of directly to the central segment. Of the six climbing species, including *R. sylvicola*, all except one belong to the group having trisegmented corona lobes.

Three groups are discernible in the Periplocoideae with regard to floral structure. Two of these groups have a very distinct upper corolla tube, comparable to that found in the Apocynaceae sensu stricto. In the first group the upper corolla tube is well developed and the gynostegium included near the base of the corolla (tribe Cryptolepideae Venter). The second group also has a distinct upper corolla tube, but the stamens arise at the corolla mouth and the gynostegium is thus exserted from the corolla mouth (tribe Gymnanthereae Venter). The third group of genera is characterized by the absence of an upper corolla tube, and the stamens are thus completely exposed (tribe Periploceae Venter). The authors regard the Cryptolepideae as least advanced (plesiomorphic) in the Periplocoideae, and the last two tribes as advanced (apomorphic). *Raphionacme* belongs to the Gymnanthereae, and *R. sylvicola* is thus regarded as an advanced species with respect to its floral structure, but as less advanced in the genus because it is a climber.

Acknowledgments. We thank the University of the Free State, Bloemfontein, and the National Research Foundation, Pretoria, for their financial sup-

port toward the revision of the Periplocoideae. We also extend thanks to K and MO for kindly lending the two specimens on which this new species is based, to L. F. van Ryneveld for translating the diagnosis into Latin, and Joan Walker for correcting the manuscript grammatically.

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Nuevas Especies y Combinaciones en Leguminosas de Mesoamérica

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RESUMEN. Durante la preparación del tratamiento de las Leguminosas para el el proyecto Manual de las Plantas de Costa Rica nuevas especies han sido descubiertas en los géneros *Dalbergia* y *Pterocarpus*, y se proponen nuevas combinaciones en los géneros *Desmodium* y *Dioclea*.

ABSTRACT. During the preparation of the treatment of the Legumes for the *Manual de las Plantas de Costa Rica* project, new species in the genera *Dalbergia* and *Pterocarpus* were discovered; proposals for new combinations in the genera *Desmodium* and *Dioclea* were also deemed necessary.

Dalbergia tilarana se distingue por su inflorescencia amplia, ramificada y con muchas flores; está relacionada con *D. stevensonii* Standley, pero ésta tiene flores y frutos más pequeños y la inflorescencia más corta y laxa. *Pterocarpus michelianus* se distingue por ser una especie completamente caducifolia de habitats secos y calientes, donde su relación ecológica y taxonómica se da con *P. amphymenium* DC.; se distingue de esta última en sus hojas y frutos glabros e inflorescencias con una pubescencia ferrugínea muy corta contrario a una pubescencia blanquecina en hojas, frutos e inflorescencias en *P. amphymenium*. Se transfiere a *Desmodium strobilaceum* Schlechtendal, al rango de variedad bajo la especie *Desmodium sericophyllum* Schlechtendal, dado que ambas especies sólo difieren en la pubescencia y la forma de los folíolos. Se transfiere además la especie *Cymbosema roseum* Bentham, al género *Dioclea* (*D. rosea* (Bentham) N. Zamora, comb. nov.), ya que la característica del estambre vexilar libre está presente también en algunas especies del género *Dioclea*.

Dalbergia tilarana N. Zamora, sp. nov. TIPO: Costa Rica. Guanacaste: Cantón de Tilarán, El Dos de Tilarán, 2 km NE of El Dos on ridge top, 10°23′N, 84°53′W, 1120 m, 11 Mar. 1992 (fl, fr), *W. Haber, Zuchowski & Bello 11050* (holótipo, INB; isótipos, CR, F, MEXU, MO, US). Figura 1.

Arbor 5–10 m, ramulis glabratis; petioli 2–4.3 cm longi; rhachide 5.5–10 cm longa, petiolulis 3–6 mm longis; foliola 5–9, elliptica, (2.3–)3.5–7.2 × (1.5–)2–3.7 cm, apice acuto, obtuso vel exigue retuso, basi obtusa, supra glabrata, subtus minute ferrugineo-sericea. Panicula 10–14 cm longa, rhachidibus sparse ferrugineo-strigosis. Flores subsessiles, 5–7(–8) mm longi; calyx campanulatus, 3–3.5 mm longus, extus ferrugineo-sericeus; petala alba, vexillo 5–6 mm longo, obovato, apice emarginato. Stamina 9. Legumina oblanceolata, valde compressa, coriacea, apice obtusa, basi attenuata, 5.5–7.5 × 1.5–1.7 cm, monosperma, stipite 6–11 mm longo.

Arbol 5–10 m, ramitas esencialmente glabras, los brotes denso ferrugíneo sericeos; estípulas decíduas, 7 × 2 mm. Hojas imparipinnadas; pecíolo 2–4.3 cm de largo, glabro; raquis de 5.5–10 cm de largo, glabro; folíolos alternos o subopuestos, 5–9, elípticos o a veces los basales ovados, (2.3–)3.5–7.2 cm de largo, (1.5–)2–3.7 cm de ancho, ápice agudo, obtuso o leve retuso, base obtusa, nervio central inmerso en el haz y prominente en el envés, nervios secundarios y reticulación levemente impresa, glabros en el haz y diminuto-estrigoso-ferrugíneos en el envés; peciólulos 3–6 mm de largo, glabros. Inflorescencias panículas muy abiertas, ramificadas y con numerosas flores, axilares o terminales, 10–14 cm de largo, pedúnculo 3–6 cm de largo, glabro o esparcido-seríceo, ejes esparcido-ferrugíneo-seríceo, bracteolas 0.5–1 mm de largo, ovadas y decíduas. Flores 5–7(–8) mm de largo, cáliz verde-pálido y pétalos blancos; pedicelos 0.5–1 mm de largo, claramente articulados en el ápice y la base. Cáliz campanulado, 3–3.5 mm de largo, ferrugíneo-seríceo externamente y glabro internamente; lóbulos adaxiles 1.1 mm de largo, ovados, con el ápice redondeado u obtuso, lóbulo abaxial hasta 1.7 mm de largo y atenuado. Pétalos de la quilla y alas de 3.5–4 mm de largo, auriculados y muy estrechos en la base; estandarte 5–6 mm de largo, recto o reflexo, obovado, ápice emarginado, atenuado en la base. Estambres 9. Pistilo 3–4.5 mm de largo, largo-estipitado, estípite ferrugíneo-estrigoso; ovario ferrugíneo-seríceo en ambos márgenes y glabro en el centro; estigma glabro. Frutos 5.5–7.5 × 1.5–1.7 cm, oblanceolados, ápice obtuso y base atenuada, glabros, estípete 6–11 mm de largo; semilla 1, el área seminal conspicuamente nervado-reticulada.

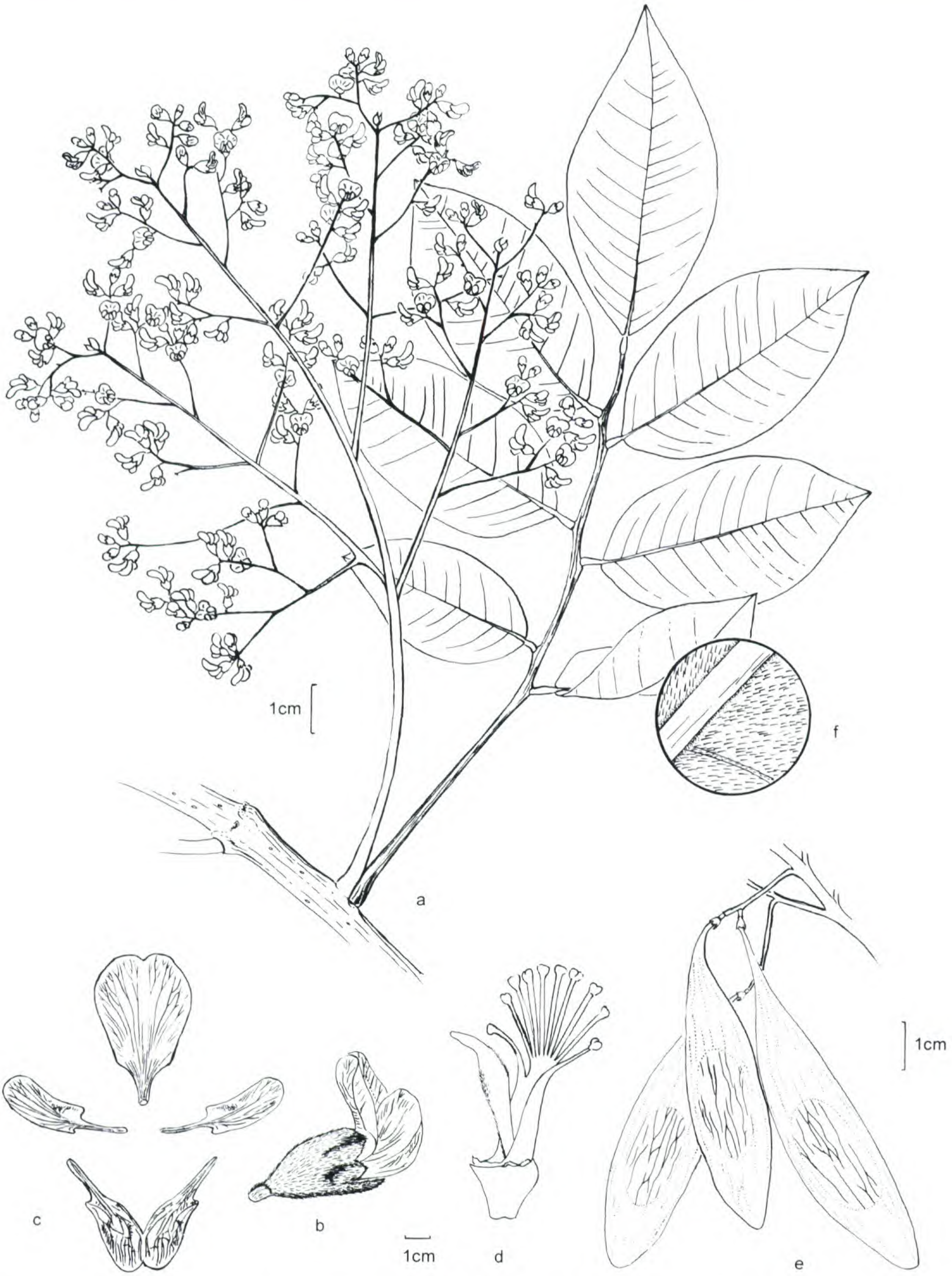

Figura 1. *Dalbergia tilarana* N. Zamora. —a. Rama con flores. —b. Flor. —c. Pétalos. —d. Flor sin cáliz y pétalos. —e. Frutos. —f. Pubescencia sobre el envés de la lámina. (Basado en el material de *W. Haber et al. 11050*, INB).

Esta especie podria ser confundida con *D. stevensonii*, por el número y forma de los folíolos, pero *D. tilarana* tiene una inflorescencia más grande y abierta, con las bracteolas ovadas decíduas, flores de mayor tamaño (5–8 mm) y numerosas, y frutos oblanceolados; mientras en *D. stevensonii* la inflorescencia es más corta, laxa, con las bracteolas lineares persistentes, flores más pequeñas (4 mm), y frutos oblongos.

Distribución. Nicaragua (Jiñotega y Matagalpa), Costa Rica (Guanacaste) y Panamá (Coclé). Elevación 1100–1450 m.

Fenología. Flores observadas en marzo y octubre; frutos en marzo, junio y noviembre.

A veces los frutos llegan a ser atacados por insectos (fide *Haber & Bello 7333*) por lo que no alcanzan su tamaño normal.

Habitat. Climas muy húmedos con bosques montanos.

Parátipos. NICARAGUA. **Jinotega:** Santa Lastenia, between Matagalpa and Jinotega, ca. 13°02′N, 85°57′W, 1450 m, 5 June 1982 (fr), *Stevens 21537* (MO). **Matagalpa:** Cerro El Picacho, lower montane forest, 13°00′N, 85°55′W, 1440 m, 6 Jan. 1984, *Gentry et al. 44080* (MO); Cerro El Picacho, lower montane forest, 13°00′N, 85°55′W, 1420 m, *Gentry et al. 44053* (MO). COSTA RICA. **Guanacaste:** Tilarán, Cerro Frío, Cerro La Chiripa, 3 km NE de El Dos de Tilarán, 10°25′N, 84°53′W, 1200 m, 10 Nov. 1986 (fr), *Haber & Bello 6357* (INB, MO); Cerro Frío, Tilarán, Zona Monteverde, vertiente pacífica, 10°25′N, 84°53′W, 1100 m, 30 June 1987 (fr), *Haber & Bello 7333* (INB, MO). PANAMA. **Coclé:** El Cope on Pacific side 1/2 hour walk from sawmill, 2400 ft., 16 Oct. 1979 (fl), *Antonio 2120* (MO).

Pterocarpus michelianus N. Zamora, sp. nov. TIPO: Costa Rica. Guanacaste: Parque Nacional Palo Verde Area de Conservación Tempisque, Sector Refugio Palo Verde, camino principal, 10°21′N, 85°21′W, 20 m, 15 Feb. 1992 (fl), *U. Chavarría 553* (holótipo, INB; isótipos, MEXU, MO). Figura 2.

Arbor 7–15 m, ramulis glabratis vel ferrugineo-pilosis; petioli 2.5–6 cm longi; rhachidibus 4–7.5 cm longis, petiolulis 4–9 mm longis; foliola (3–)5–8, ovata obovata vel elliptica, distalia 7.2–12.5 × 4.4–7.8 cm, basalia 4.2–7.5 × 2.3–4.7 cm, apice apiculata, basi rotundata vel obtusa, glabrata. Racemi 3.5–17.5 cm longi, rhachidibus dense velutino-tomentosis. Flores pedicellati, 16–17 mm longi; calyx campanulatus, (5–)6–9 mm longus, extus dense velutino-sericeus; petala aurea vexillo 16 × 17 mm, orbiculato, apice emarginato. Stamina monadelpha. Legumina rotundata vel orbiculata, 4.5–6.1 × 3.8–5.5 cm, membranacea, glabrata; monosperma.

Arbol 7–15 m, ramitas jovenes pardo-pálidas, glabras o ferrugíneo-pilosas; estípulas lineares de 5–8 × 1 mm, decíduas. Hojas imparipinnadas, alternas, con (3–)5–8 folíolos, alternos, folíolos distales de 7.2–12.5 × 4.4–7.8 cm, ovados, obovados o elípticos; folíolos basales de 4.2–7.5 × 2.3–4.7 cm, ovados; ápice apiculado, base redondeada y obtusa, glabros y reticulados en ambas caras; raquis de 4–7.5 cm de largo, pecíolulos de 4–9 mm de largo; pecíolo de 2.5–6 cm de largo. Inflorescencia racemosa, 3.5–17.5 cm de largo, pedúnculo de 1.5–1.7 cm de largo; brácteas de 1.5–3 mm de largo, lineares; bracteolas de 1–1.5 mm de largo, lineares. Flores de 16–17 mm de largo, anaranjadas o color oro, pedicelos de 3–11 mm de largo; cáliz incurvado, tubo de (4–)5–7 × 4.5 mm, denso ferrugíneo-pilosos lóbulos 1–2 mm de largo, triangulares, pubescentes en ambas caras; alas de 15–16 × 6.5–7 mm, oblongas y auriculadas en la base, uña hasta 5 mm de largo; quilla de 14 × 5–6 mm, oblonga, auriculada en la base, uña de 5 mm de largo; estandarte de 16 × 17 mm, orbicular y emarginado, uña de 3–4 mm de largo; estambres de 10–14 mm de largo, tubo estaminal de 8 mm de largo; pistilo de 15 mm de largo; ovario de 5 mm de largo, denso ferrugíneo-piloso; estilo de 10 mm de largo, sigmoide, piloso en la base; óvulos 6–7. Frutos legumbres samaroides, de 4.5–6.1 × 3.8–5.5 cm, redondeados u orbiculares, amarillentos o color paja, membranáceos y glabros; semilla 1.

La primera colección de esta especie fue hecha por E. Langlassé (*Langlassé 157*) en 1898 en el estado de Guerrero, México. Esta colección formó parte de la descripción de la especie *P. aphyllus* Micheli, descrita por Micheli en 1903. Micheli tomó como base para la descripción de *P. aphyllus* las colecciones *Langlassé 123* con frutos (US) y *Langlassé 157* con flores (US), sin designar una de ellas como tipo. Más tarde Rojo (1972) designó como tipo la colección *Langlassé 123* con frutos y al mismo tiempo sinonimizó *P. aphyllus* bajo *P. amphymenium* DC.

Al estudiar con cuidado ambas colecciones descubrí que se trata de dos especies diferentes y en efecto la colección con frutos (*Langlassé 123*) corresponde a *P. amphymenium.* La colección con flores es una especie distinta y no descrita, para la cual propongo el nombre *Pterocarpus michelianus.*

Pterocarpus michelianus difiere de *P. amphymenium* en la pubescencia parda-corta de la inflorescencia y cáliz, así como folíolos y frutos glabros; contrario a una pubescencia densa blanquecina o grisácea de la inflorescencia y cáliz, frutos densosedoso blanquecino pubescentes y folíolos densopilosos en el envés en *P. amphymenium.* Geográficamente *P. amphymenium* está restringida al extremo suroeste de México, mientras *P. micheli-*

Figura 2. *Pterocarpus michelianus* N. Zamora. —a. Hoja. —b. Inflorescencias. —c. Flor. —d. Pétalos. —e. Flor sin pétalos. —f. Frutos. —g. Reticulación de la lámina. (Flores y hoja basados en el material de *U. Chavarría & A. Fernández 1681* (INB), frutos de *R. Ocampo 1889* (CR)).

anus ocurre desde México (Guerrero) hasta Costa Rica.

La mayoría del material de *P. michelianus* ha sido mal identificado como *P. rohrii* Vahl, la cual es una especie de habitats más húmedos, con frutos de mayor tamaño y flores color amarillo-verdosas.

Distribución. México (Guerrero) hasta Costa Rica. En Costa Rica en la costa pacífica, desde Guanacaste hasta el valle del Río Tarcoles, San José. Elevación 0–900 m.

Fenología. Flores han sido observadas de enero a mayo. Frutos de febrero a mayo. Su máxima

floración se da cuando el árbol está sin hojas y las flores cubren completamente la copa. El color amarillo-oro de las flores lo hacen distintivo a la distancia y además sugiere que sería una buena especie para el embellecimiento de áreas verdes en climas secos.

Habitat. Climas secos con vegetación caducifolia.

Parátipos. MEXICO. **Guerrero:** La Orilla, 30 m, 11 May 1898 (fl), *Langlassé 157* (US); between Santa Maria Guenagati and Guichixu, Tehuantepec, Oaxaca, 100 m, 7 Mar. 1985 (fl), *McCarter & Styles 352* (K). GUATEMALA. **Zacapa:** between Mayuelas and Arenal close to the main road toward Puerto Barrios about 163 km E of Guatemala City in a small side valley of the Río Motagua, 15°8′N, 89°22′W, 130 m, 23 Mar. 1988 (fl), *Hughes 1121* (K). **Chiquimula:** close to the road from Sabana Grande to San José la Arada about 3 km E of San Jose, about 6 km S of the departmental town of Chiquimula, 14°44′N, 89°34′W, 400 m, 28 Feb. 1998 (fl), *Hughes 1100* (K). HONDURAS. Between Tapaire and Guayabillas around 15 km NE of Choluteca, 170 m, 13 Feb. 1984 (fl), *Hughes 131* (K). NICARAGUA. Between Empalme San Benito and Las Maderas on Panamerican Highway ca. 40 km NE of Managua, 75 m., 20 Apr. 1986 (fr), *Hughes 813* (K); Boaco on the road from Managua to Boaco, 50 km from Managua, before the turnoff to Boaco, 12°23′N, 85°53′W, 200 m, 17 Mar. 1991 (fl), *Styles 131* (K); 20 km N of Estelí close to Panamerican Highway, Estelí, 900 m, 3 Apr. 1984 (fl), *Hughes 450* (K). COSTA RICA. **Guanacaste:** Liberia, P.N. Santa Rosa, Río Calera, Santa Rosa, 10°50′00″N, 85°37′00″W, 300 m, 22 Mar. 1996 (fl), *Chavarría & Fernández 1681* (MO); P. N. Palo Verde Area de Conservación Tempisque, Sector Refugio Palo Verde, camino principal, 10°21′N, 85°21′W, 20 m, 15 Feb. 1992 (fl), *Chavarría 553* (MO, INB); tree ca. 25 m tall, dry forest, near Finca Escameka, ca. 12 km S of Las Cañas, 10 Mar. 1965 (fl), *Godfrey 66953* (MO); Cañas, Hacienda La Catalina, 100 m, 19 Mar. 1978 (fr), *Ocampo 1889* (CR). **Bagaces:** P.N. Palo Verde, Valle de Tempisque, Sector Catalina, 10°21′00″N, 85°21′00″W, 10 m, 4 Apr. 1995 (fr), *Chavarría 1245* (MO, INB); Palo Verde E of river valley forest, 100 m, 14 Apr. 1969 (fr), *Frankie 91a* (MO); on the banks of the Rio Calera or lowlands of Santa Rosa N. P., 8 May 1976 (fl), *Janzen 10360* (MO), 8 May 1976 (fr), *Janzen 10359* (MO); Finca La Pacifica, 5 km NW of Cañas, 80 m, 22 Feb. 1969 (fl), *Davidse 1465* (MO); Orillos del Río Poza Solado, P. N. Santa Rosa, 21 Feb. 1986 (fl), *Zamora 1192* (MO, CR); Finca Escambeka, Taboga, Cañas, 8 km al SO de Cañas, 200–300 m, 10 Mar. 1965 (fl), *Jiménez 3096* (MO); Montenegro S of Bagaces, 27 Jan. 1969 (fl), *Gentry 326* (MO); Comelco, dry deciduous tropical forest, 50–100 m, 27 Jan. 1970 (fl), *Bawa 125* (MO); bank of Rio Tempisguito, 20 m E of Panamerican Highway, 4 mi. S of park entrance, 5 Feb. 1977 (fl), *Boucher 708* (MO); Santa Rosa National Park, ca. 10°50′N, 85°37′W, 0–320 m, 14 May 1978, *Janzen 10916* (MO); OTS research area A, Steward property, 28 km N of Cañas, elev. 100 m, 2 Oct. 1969, *Frankie 293a* (MO); beside Panamerican highway, 1 km N of Las Cañas, 40 ft., 10 in., 14 Apr. 1943 (fr), *Barbour 1005* (MO); 5 km W of Bagaces on road to Palo Verde N. P. on flat ground between Rio Tempesque and volcanoes to E, 10°26′N, 86°15′W, 6 Feb. 1993 (fl), *Hughes 1738* (MO); Montenegro S of Bagaces, 27 Jan. 1969 (fl), *Gentry 326* (MO); Carretera Interamericana at jct. with Río Seco, less than 100 m, 18 Nov. 1984, *Khan, Tebbs & Vickery 1167* (BM); Environs de Nicoya, Apr. 1900 (fr), *Tonduz 13972* (K). **San José:** Turrubares, Valle del Tárcoles, San Pablo, cerca del puente sobre el Río Tárcoles, camino hacia Atenas, 9°54′45″N, 84°28′50″W, 100–200 m, 23 Feb, 1994 (fl), *Ramírez et al. 263* (INB, CR).

Desmodium sericophyllum Schlechtendal var. **strobilaceum** (Schlechtendal) N. Zamora, comb. nov. Basiónimo: *Desmodium strobilaceum* Schlechtendal, Linneae 12: 316. 1838. TIPO: México. Jalapa: Jalapa, 28 Agosto (año perdido), *Schiede s.n.*, destino desconocido.

Hierba erecta o postrada, hasta 1 m?; ramitas anguladas y surcadas, con pubescencia densa blanquecino-serícea-adpresa, esparcida o glabrescente; estípulas 8–12 mm de largo, triangular-acuminadas, decíduas. Hojas trifolioladas, folíolos (3–)4.5–9.7 × (1–)1.5–2.5(–3.8) cm, oblongos a oblongo-elípticos, ápice obtuso, denso-blanquecino-seríceos en el envés. Flores y frutos iguales a var. *sericophyllum.*

Propongo la anterior combinación ya que *Desmodium strobilaceum* sólo difiere de *D. sericophyllum* en el tipo de pubescencia y la forma de los folíolos. Las variedades se distinguen así:

1a. Ramitas con una pubescencia velutina-densa; folíolos ovado-elípticos, oblongos, orbiculares o suborbiculares, lanoso-pubescentes en el envés . . . . . *D. sericophyllum* var. *sericophyllum*

1b. Ramitas con una pubescencia serícea-adpresa; folíolos oblongos a oblongo-elípticos, seríceo-pubescentes, seríceo-adpresa, esparcida o glabrescente en el envés. . . . . *D. sericophyllum* var. *strobilaceum*

Dioclea rosea (Bentham) N. Zamora, comb. nov. Basiónimo: *Cymbosema roseum* Bentham, J. Bot. (Hooker) 2: 60. 1840. TIPO: Brazil. "Rio Branco", *R. H. Schomburkg 850* (holótipo, K).

Dioclea purpurea Poepp., Nov. Gen. & Sp. 3: 59. 1845.

Al estudiar las características taxonómicas genéricas distintivas entre *Cymbosema* y *Dioclea* he encontrado que no hay una característica significativa para mantener a *Cymbosema*, género monotípico, separado de *Dioclea.* Bentham (1840) en su publicación original señala que el género es aliado a *Dioclea* y que difiere de éste por tener el estambre vexilar completamente libre, flores oblongas y frutos falcados. Más tarde Maxwell (1970) detalla claramente la situación al relacionarlo también con *Dioclea* y concluye lo mismo que Bentham; además agrega que especies como *D. fimbriata* Huber, *D.*

macrantha Huber comparten características florales de forma y tamaño con *Cymbosema*. También podemos citar a *D. burkartii* Maxwell con flores similares en forma y tamaño.

El estambre vexilar libre no es una carcterística valida para conservar el género, ya que los estambres en *Dioclea* van desde pseudomonadelfos hasta diadelfos. Por ejemplo, especies como *D. reflexa* tienen el estambre vexilar completamente libre. También otras especies como *D. apiculata* Maxwell ined, y *D. mollicoma* Ducke, a veces tienen el estambre vexilar completamente libre (fide Maxwell, 1969). Los frutos en *Dioclea* son muy variables y no se pueden tomar como una característica para delimitar el género.

En 1977, James A. Lackey después de completar su tesis sobre la clasificación de Phaseolae atinadamente concluye que el mantener a *Cymbosema* como un género distinto de *Dioclea* puede ser dudoso. Estoy de acuerdo y por las razones antes expuestas propongo la combinación arriba indicada.

Agradecimientos. Deseo agradecer a Henk van der Werff por su ayuda en la preparación de la diagnósis en latin y a Claudia Aragón por sus excelentes ilustraciones. Esta investigación fue financiada por la Asistencia Holandesa para el Desarrollo (NEDA) a través del proyecto "Desarrollo del conocimiento de la Biodiversidad y Uso Sostenible en Costa Rica" conducido por el Instituto Nacional de Biodiversidad de Costa Rica (INBio). Además esta investigación fue posible debido al convenio de cooperación entre el Ministerio del Ambiente y Energia (MINAE) y INBio para llevar acabo el Inventario Nacional de Biodiversidad.

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Two New Combinations in Central Asian and Chinese *Allium* (Alliaceae)

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ABSTRACT. In preparing the account of *Allium* L. for the *Flora of China*, Volume 24, two new combinations are made in order to recognize entities at varietal rank within the complex of *A. atrosanguineum* Schrenk: *A. atrosanguineum* var. *fedschenkoanum* (Regel) G. Zhu & Turland and *A. atrosanguineum* var. *tibeticum* (Regel) G. Zhu & Turland. Lectotypes are herein designated for both names. The priority of *A. atrosanguineum* over *A. monadelphum* Turczaninow ex Karelin & Kirilov (published in the same year) is explained.

Allium atrosanguineum is a Central Asian and Chinese species sometimes treated as *A. monadelphum*, e.g., by Vvedensky (1935: 146–147). It is characterized as follows: roots thin; bulbs cylindric; leaves terete, fistulose; scape terete; filaments shorter than tepals, connate into a tube for 1/3–3/4 their length, entire; ovary with ovules 2 to several per locule. While preparing the account of *Allium* for the *Flora of China*, Volume 24 (Xu & Kamelin, in press), the present authors together with J. M. Xu and R. V. Kamelin considered it appropriate to recognize three entities within the complex of *A. atrosanguineum* at varietal rank, necessitating two new combinations: *A. atrosanguineum* var. *fedschenkoanum* (Regel) G. Zhu & Turland (based on *A. fedschenkoanum* Regel) and *A. atrosanguineum* var. *tibeticum* (Regel) G. Zhu & Turland (based on *A. monadelphum* var. *tibeticum* Regel).

The name *Allium monadelphum* Turczaninow ex Karelin & Kirilov (1842: 508) is synonymous with, and has been regarded as senior to, *A. atrosanguineum* Schrenk (1842: 355), e.g., by Regel (1887), who combined *A. atrosanguineum* at varietal rank (p. 309) under *A. monadelphum*, which he erroneously cited (p. 307) as having been published by Turczaninow (1838: 102), where it was in fact invalid as a nomen nudum. *Allium monadelphum* was first validly published in late 1842 (see Stafleu & Cowan, 1979: 497, no. 3515), whereas *A. atrosanguineum* was published slightly earlier, on 18 July 1842 (the date printed on the end page of the relevant issue of the journal, p. 367). Therefore, if the two are treated as conspecific, *A. atrosanguineum* is the correct name.

Allium atrosanguineum var. **fedschenkoanum** (Regel) G. Zhu & Turland, comb. nov. Basionym: *Allium fedschenkoanum* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 3(2): 82. 1875. *Allium fedschenkoanum* var. *elatum* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 3(2): 82. 1875. *Allium monadelphum* Turczaninow ex Karelin & Kirilov var. *fedschenkoanum* (Regel) Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 10: 308. 1887. TYPE: "In valle Sarawschansk Turkestaniae," s.d., *O. Fedchenko s.n.* (lectotype, here designated, LE).

In the protologue of *Allium fedschenkoanum*, Regel (1875: 82–83) cited two specimens, both collected by O. Fedchenko: one under variety [α] *elatum* ("In valle Sarawschansk Turkestaniae legit O. Fedschenko") and the other under variety [β] *humile* Regel ("In montibus ad fluvium Sarawschansk, 6–9000′ alt. Turkestaniae, legit O. Fedschenko"). These were the only two varieties described; the autonym was not explicitly cited. Regel later (1887: 308, 311) recombined both *A. fedschenkoanum* and its variety *humile* (without explicit mention of var. *elatum*) as varieties of *A. monadelphum*. The two specimens originally cited under the varieties of *A. fedschenkoanum* were cited again under *A. monadelphum* var. [β] *fedschenkoanum* ("in valle fluvii Sarawschan 3–7000′ alt.") and variety [ζ] *humile* ("In valle fluvii Sarawschan 8–9000′ alt."). It seems reasonable to assume that "in valle" and "in montibus ad fluvium" in 1875 equate with "3–7000′ alt." and "8–9000′ alt." in 1887, respectively. Indeed, Regel cited no other specimens collected by O. Fedchenko under *A. monadelphum* s.l. in 1887. It is therefore inferred that Regel considered variety *elatum* to represent the typical element within *A. fedschenkoanum*, if not in 1875, then certainly in 1887. Accordingly, the specimen cited in 1875 under variety *elatum* is here designated as the lectotype of *A. fedschenkoanum*.

Allium atrosanguineum var. *fedschenkoanum* is characterized by having tepals whitish yellow to

pink with a yellowish base (subsequently becoming yellowish white), oblong-lanceolate, 10–15 mm long, the margin sometimes minutely denticulate, and the apex attenuate. The variety is distributed in Afghanistan, China (Xinjiang and Xizang provinces), Kazakstan, Kyrgyzstan, India, Pakistan, Tajikistan, and Uzbekistan.

Allium atrosanguineum var. **tibeticum** (Regel) G. Zhu & Turland, comb. nov. Basionym: *Allium monadelphum* var. *tibeticum* Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 10: 311. 1887. TYPE: China. Qinghai: "In *Tibeti borealis* declivibus jugorum inter Hoangho et Yang-tse in glareosis limosis," s.d., *N. M. Przewalski s.n.* (lectotype, here designated, LE).

In the protologue of *Allium monadelphum* var. *tibeticum*, Regel cited two specimens: "In *Tibeti borealis* declivibus jugorum inter Hoangho et Yang-tse in glareosis limosis,—nec non in *Chinae occidentalis* regione Tangut provinciae Kansu 13,000′ alt., prope altem Dshachar-Dsargyn (N. M. Przewalski)." Either specimen would be eligible as the lectotype of variety *tibeticum*, and it seems appropriate for a taxon so named to be represented by a type from the Tibetan Plateau (Xizang and Qinghai provinces, China), so the latter specimen is here designated as the lectotype.

Allium atrosanguineum var. *tibeticum* is characterized by having tepals brass yellow to copper red and lustrous with a pinkish apex and base (subsequently becoming pale yellow), oblong-obovate, 10–16 mm long, and the apex rounded. The variety is endemic to China (Gansu, Qinghai, Sichuan, Xizang, and Yunnan provinces).

For comparison, variety *atrosanguineum* has tepals purple-red and minutely black dotted (subsequently becoming yellowish white to grayish pink), oblong-obovate, oblong, or oblong-lanceolate, 7–9 mm long, and the apex subacute (but never attenuate). It is more broadly distributed in Afghanistan, China (Qinghai, Sichuan, and Xinjiang provinces), Kazakstan, Kyrgyzstan, Mongolia, Russia, and Tajikistan.

Acknowledgments. We thank Rudolf V. Kamelin (LE) for outlining the taxonomic situation of *Allium atrosanguineum* and alerting us to the need for these new combinations. We also thank Anthony R. Brach (MO c/o Harvard) for help in examining original literature.

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Paspalum volcanensis, a New Species of Subgenus *Anachyris* of *Paspalum* (Poaceae: Paniceae)

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ABSTRACT. A new species of Poaceae, *Paspalum volcanensis*, from southern Bolivia and northwestern Argentina, is described and illustrated. Its concavo-convex spikelets and upper lemma with conspicuous nerves are characters it shares with other species of subgenus *Anachyris* of *Paspalum*. A key to the species of the subgenus and comments on the delimitation of the new species are provided here.

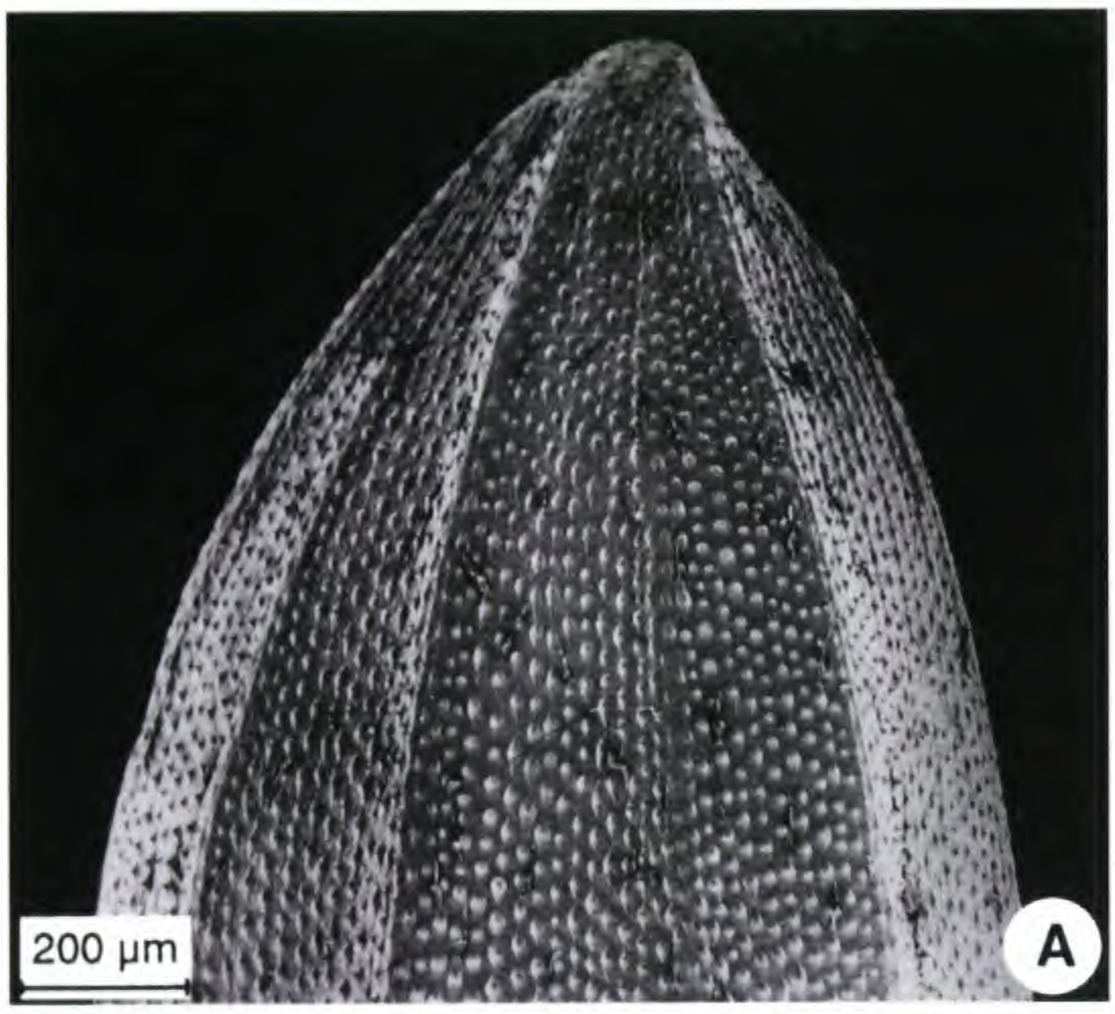
In preparation of a treatment of the genus *Paspalum* L. for *Flora Neotropica*, examination of recent collections from Bolivia and Argentina has revealed a new species within subgenus *Anachyris* (Nees) Chase.

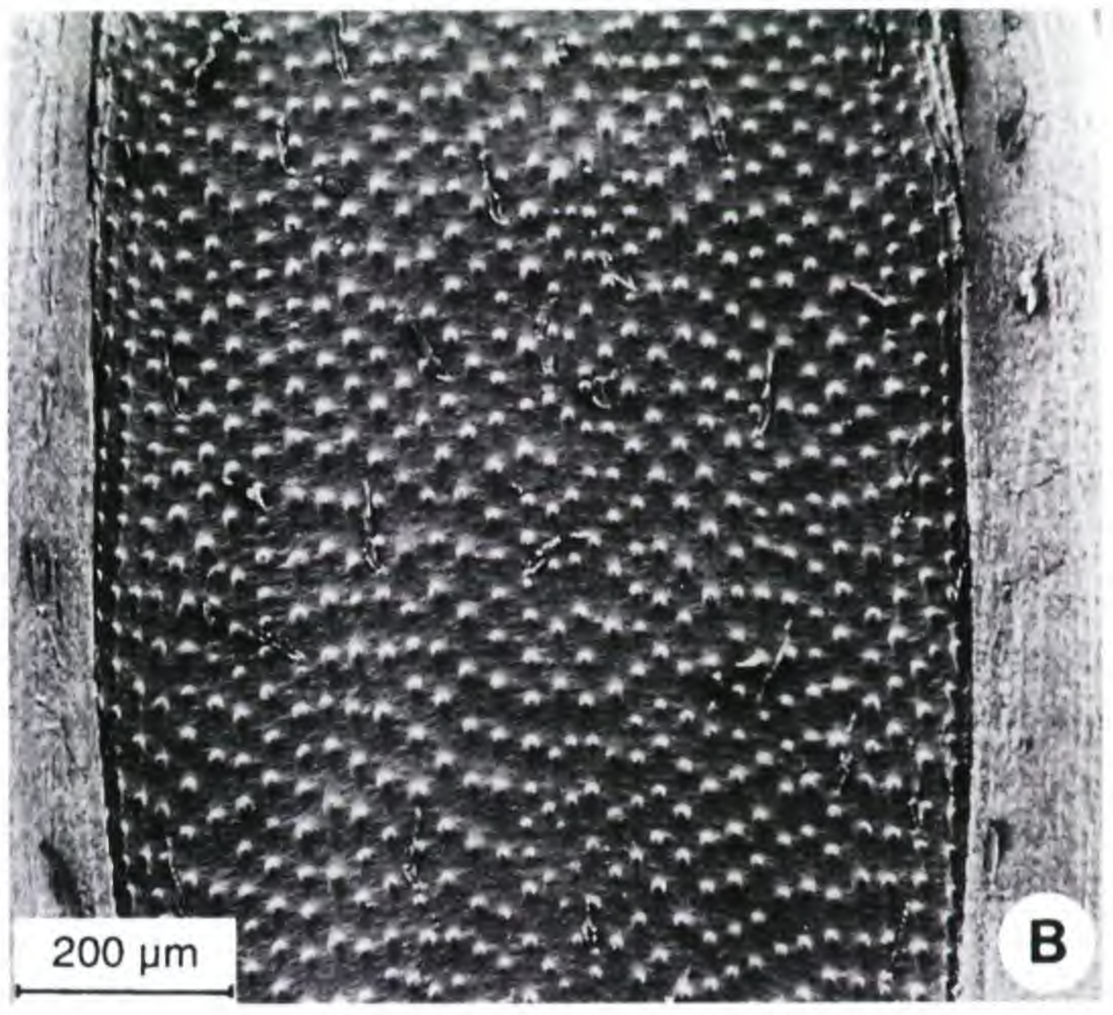
Paspalum volcanensis belongs to subgenus *Anachyris* (Nees) Chase, due to the presence of concavo-convex spikelets, and upper lemmas with conspicuous nerves on the abaxial surface. Within this subgenus, this new species is related to *P. usterii* Hackel: spikelets are pilose in both species, and the upper glume is always present. It differs from *P. usterii* by height, and inflorescence and spikelet size; the latter species grows in southern Brazil, eastern Paraguay, and northeastern Argentina, between 0 and 1200 m elevation, while *P. volcanensis* is present in southern Bolivia and northwestern Argentina, between 1000 and 2300 m elevation.

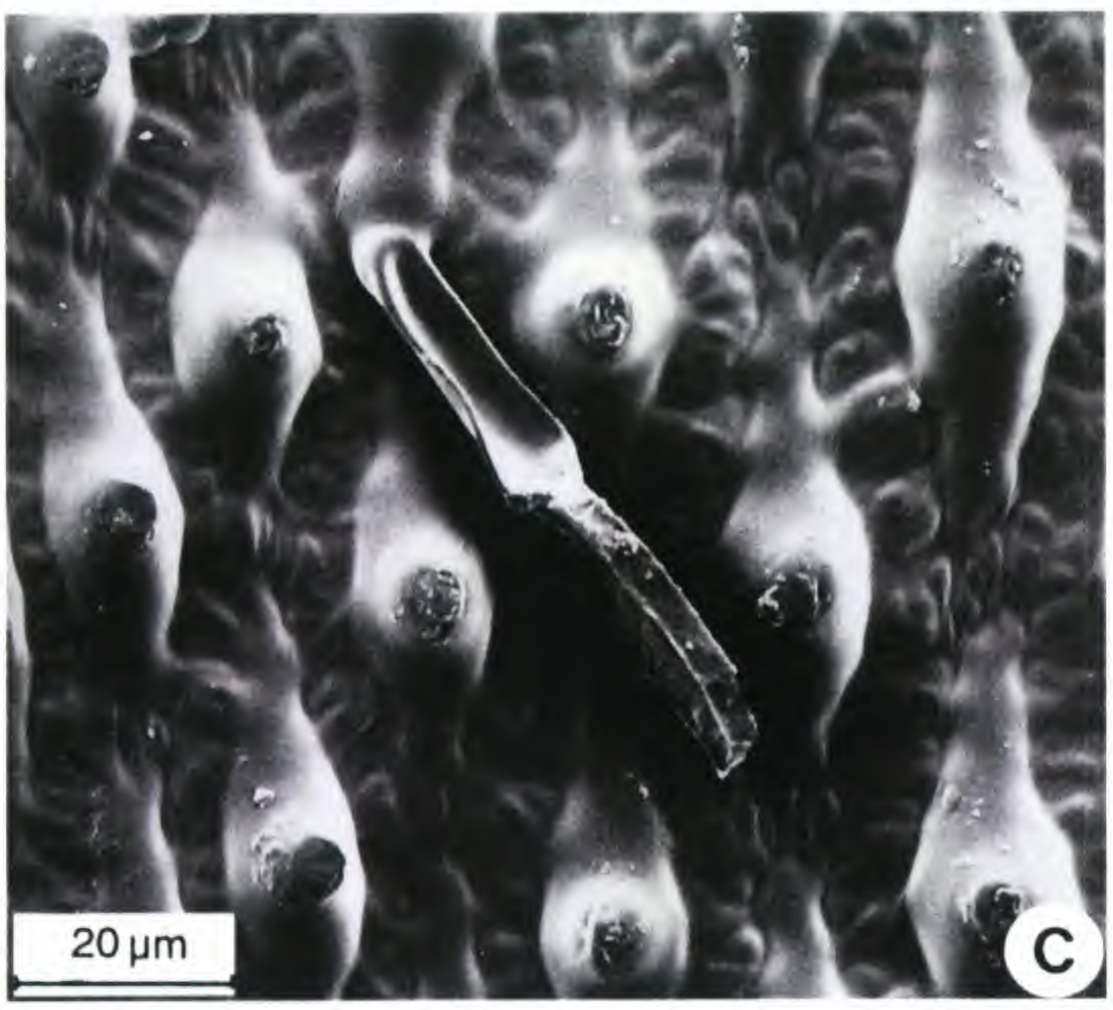
Paspalum volcanensis Zuloaga, Morrone & Denham, sp. nov. TYPE. Argentina. Jujuy: Dpto. Tumbaya, Volcán, cantera al SE del pueblo, 2100–2200 m s.m., 13 Feb. 1985, *R. Kiesling, S. Botta, C. Ezcurra, M. Sánchez & E. Ulibarri 5170* (holotype, SI; isotypes, MO, US). Figures 1A–C, 2.

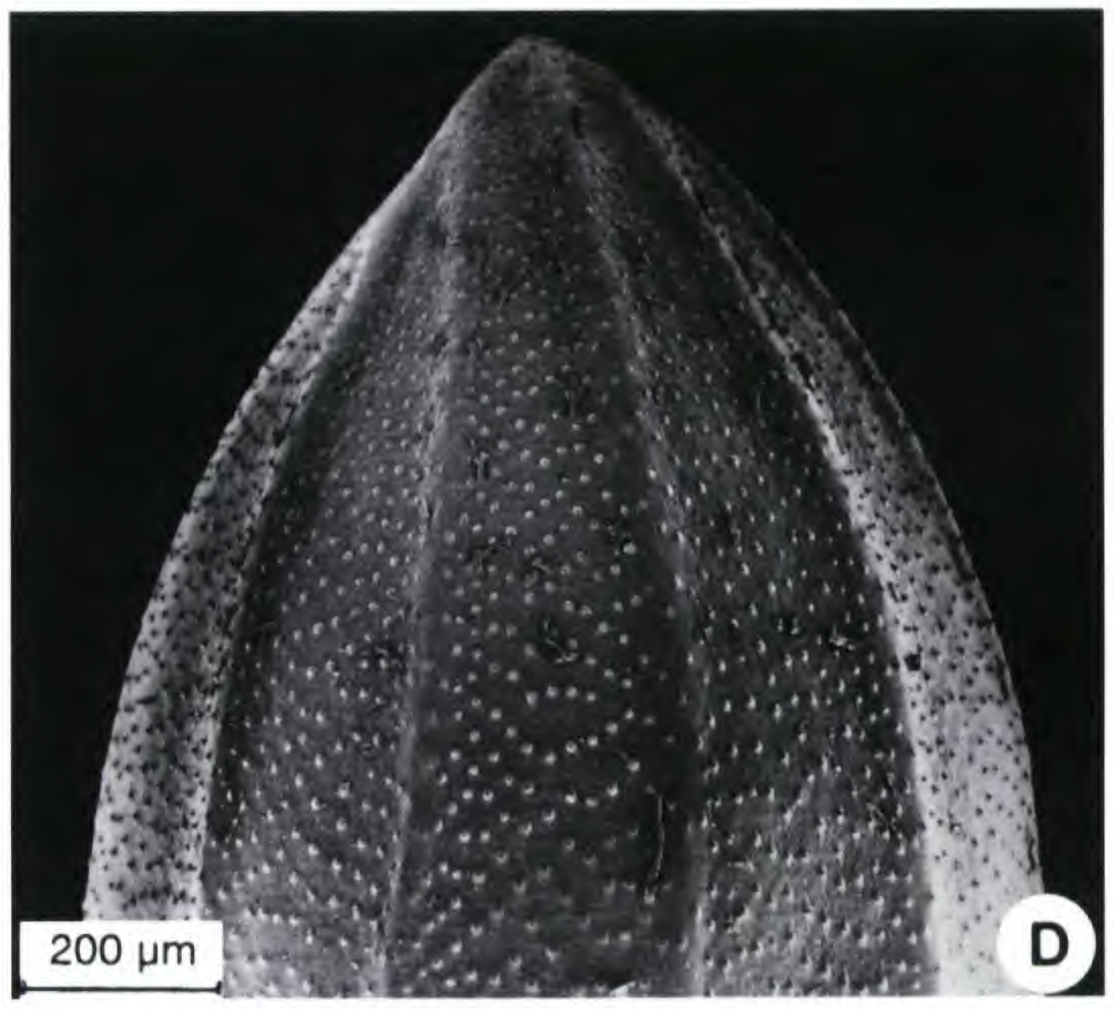
Culmi erecti, 45–60 cm alti. Laminae foliares lanceolatae, 12–22 cm longae, 0.7–1.3 cm latae. Racemi 4–19, adscendentes vel patentes, infimi 4–9 cm longi; spiculis ellipsoideis, 2.5–3 mm longis, 1.1–1.2 mm latis; gluma superiore 3-nervi; lemmate inferiore 3-nervi, palea inferiore absente; anthoecio superiore ellipsoideo; lemmate fertili valde 7-nervi.

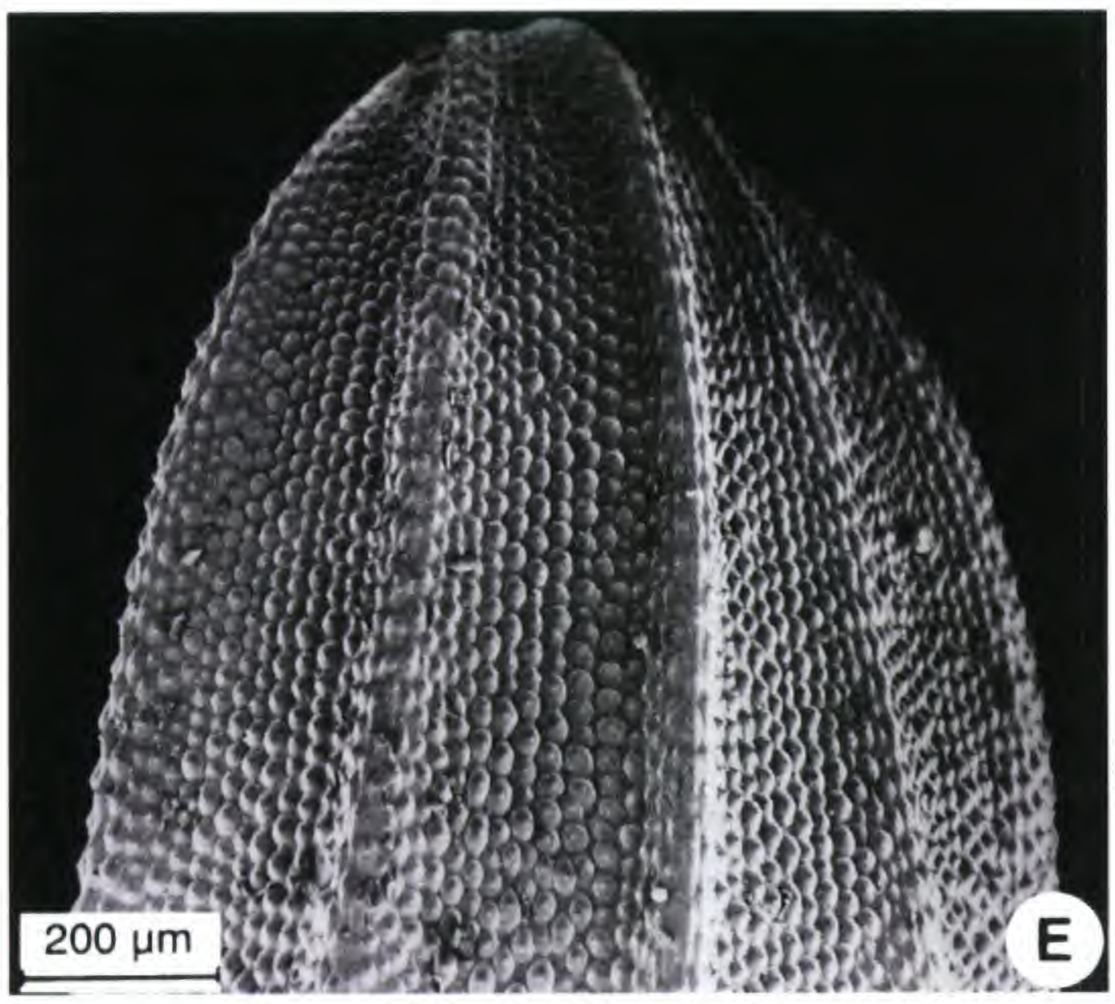
Caespitose perennials, with extravaginal innovations and short rhizomes covered by glabrous cataphylls. Floriferous culms 45–60 cm tall, 2.4–3 mm diam.; nodes 2–3, brownish, glabrous or sparsely pilose; internodes 2.5–15 cm long, glabrous, striate, stramineous. Sheaths longer or shorter than the internodes, 9.5–22 cm long, striate, slightly compressed and keeled toward the distal portion, glabrous, one margin hirsute, the other glabrous or hirsute toward the distal portion. Ligules membranous, 2–3.5 mm long, pale brown, glabrous; pseudoligule a ring of whitish hairs up to 6 mm long. Blades lanceolate, 12–22 cm long, 0.7–1.3 cm wide, flat, ascendent, slightly divergent from the culm, rounded at the base, the apex acuminate, glabrous on both surfaces or the abaxial surface papillose-pilose, the margins papillose-pilose. Peduncles 9–25 cm long, terete, glabrous. Inflorescences terminal, exserted, 9–17 cm long, 4–9 cm wide; main axes 6–10 cm long, glabrous, ending in a naked point; racemes 4–19, ending in a spikelet, alternate to subopposite, divergent from the main axes, the lower ones 4–9 cm long; pulvini covered by whitish hairs, up to 0.5 mm long; rachises 1–1.6 mm wide, glabrous, brownish or purplish, the margins papillose-pilose; spikelets imbricate, distributed in 4 series; pedicels subterete, paired, glabrous, unequal, the upper ones 0.5–1.3 mm long, the lower ones half as long as the upper ones. Spikelets ellipsoid, 2.5–3 mm long, 1.1–1.2 mm wide, concavo-convex, pilose, pale and tinged with purple. Lower glumes absent. Upper glumes ¾ to equal the spikelet length, acuminate, membranous, dorsal surface sparsely pilose, with adpressed hairs more densely disposed toward the base, margins papillose-pilose, 3-nerved, the nerves conspicuous, one central and two submarginal. Lower lemmas equal to the upper anthoecium or slightly longer, membranous, glabrous, hyaline, 3-nerved, the nerves conspicuous, depressed at base. Lower paleas absent. Upper anthoecia concavo-convex, as long as the spikelets, indurated, glabrous, finely papillose. Upper lemmas 7-nerved, the midvein and lateral veins conspicuous. Upper paleas indurated, 2-nerved; lodicules 2, ca. 0.3 mm long, conduplicate, hyaline; stamens 3, the anthers 1.6–2.2 mm











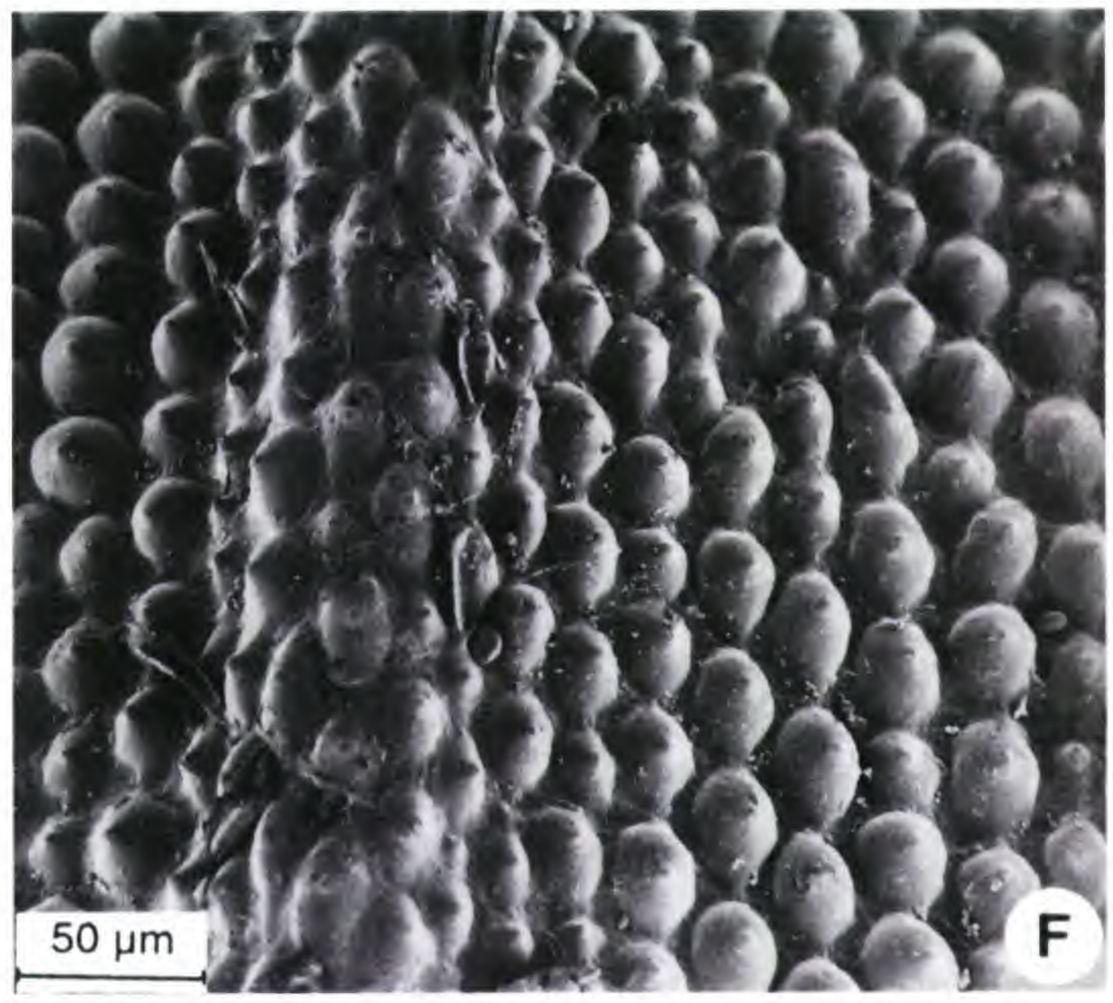


Figure 1. Scanning electron micrographs of the upper anthoecium of *Paspalum* species. A–C. *Paspalum volcanensis.*—A. Upper dorsal portion of the upper lemma. —B. Medium dorsal portion of the upper palea. —C. Detail of the surface of the upper palea with simple papillae regularly distributed and bicellular microhairs (*Kiesling et al. 5171*). —D. *Paspalum usteri.* Upper dorsal portion of the upper lemma (*Montes 1932*). E, F. *Paspalum malacophyllum.*—E. Upper dorsal portion of the upper lemma. —F. Detail of the dorsal surface of the upper lemma, with simple, regularly distributed papillae and bicellular microhairs (*Pires & Black 2293*).

Figure 2. Holotype of *Paspalum volcanensis* Zuloaga, Morrone & Denham. —A. Habit. —B. Detail of ligule. —C. Portion of the inflorescence: rachis and paired pedicels. —D. Spikelet, dorsal view showing upper glume. —E. Spikelet, ventral view showing lower lemma. —F. Upper anthoecium, dorsal view. —G. Upper anthoecium, ventral view. —H. Upper palea with stamens and lodicules. —I. Caryopsis, embryo side. —J. Caryopsis, hilum side.

long, purplish; styles 2, the stigmas purplish. Caryopses ellipsoid, 2 mm long, 0.8 mm wide; hilums elliptical; embryos ⅓ the length of the caryopses.

Distribution and ecology. This species occurs in department of Tarija, Bolivia, and in the province of Jujuy, northwestern Argentina, between 1000 and 2300 m elevation, on humid grasslands and the margins of rivers. According to Cabrera (1976), *Paspalum volcanensis* has been reported from the Yungas province and transitional areas between the Yungas and the Prepuneña provinces, in immature, permeable, rocky and sandy soils.

Chromosome number: $n = 20$ (Hunziker et al., 1998, under *Paspalum* aff. *malacophyllum*).

Paratypes. ARGENTINA. **Jujuy:** Dpto. Tumbaya, Volcán, camino a la cantera al SE de Volcán, 1010 m s.m., 23°56′S, 65°27′W, en suelo arenoso, borde de río, 15 Feb. 1997, *Zuloaga, Morrone & Pensiero 5871* (MO, SI); Volcán, cantera al SE del pueblo, 2100–2000 m s.m., 13 Feb. 1985, *Kiesling, Botta, Ezcurra, Sánchez & Ulibarri 5171* (MO, SI). BOLIVIA. **Tarija:** Prov. Méndez, 10.4 km SW of Tomatas, 5 km N of Tarija, Rincón de la Victoria, 2200–2300 m s.m., 21°32′S, 64°50′W, 10 Mayo 1983, *Solomon 10630* (MO).

Subgenus *Anachyris* (Nees) Chase of *Paspalum* can be distinguished by its concavo-convex spikelets, the upper lemma having conspicuous nerves on the abaxial surface (Fig. 1). The new species agrees with these characters and therefore is included within this subgenus. Within subgenus *Anachyris*, *P. volcanensis* is related to *P. usterii*, the only other species of this subgenus with pilose spikelets with a developed upper glume, which is absent in the remaining species of the subgenus. *Paspalum usterii* differs by its long and robust rhizomes, inflorescences 12–35 cm long with 12–60 racemose branches, and spikelets 1.8–2.4 mm long, with the upper glume 1–3-nerved, reaching ½ to ¾ the length of the spikelet and the nerves not manifest; this species grows in southern Brazil, eastern Paraguay, and Argentina, in the province of Misiones.

Paspalum volcanensis has on the abaxial epidermis of the palea and lemma bicellular microhairs of the "panicoid" type, together with simple, small papillae, regularly distributed in longitudinal rows; each papilla is associated with a long cell of the epidermis (Fig. 1A–C); a similar pattern was found in the lemma and palea of *P. usteri* (Fig. 1D). *Paspalum malacophyllum* Trinius, *P. simplex* Morong, and *P. procurrens* Quarín are, on the contrary, distinguished by the presence of simple papillae as long as the epidermal cells, which cover the tangential external wall of the long cells (Fig. 1E, F).

The following key differentiates the currently recognized species of *Paspalum* subg. *Anachyris*:

1. Spikelets pilose; upper glume present; upper lemma and palea with inconspicuous nerves and a small papilla on each epidermal cell . . 2
1′. Spikelets glabrous; upper glume absent; upper lemma and palea with conspicuous nerves and a large papilla on each epidermal cell 3
2(1). Plants 1–2 m tall; rhizomes long and robust; culms lignified; inflorescences 12–35 cm long, 8–15 cm wide, with 12–60 racemose branches, the lower ones 6–12 cm long; spikelets 1.8–2.5 mm long; upper glume ½–¾ as long as the spikelet, 1–3-nerved, the nerves not manifest; northeastern Argentina and southern Brazil . . . . . *P. usterii*
2′. Plants 45–60 cm tall; rhizomes short; culms herbaceous; inflorescences 9–17 cm long, 4–9 cm wide, with 4–19 racemose branches, the lower ones 4–9 cm long; spikelets 2.5–3 mm long; upper glume ¾ to equal the length of the spikelet, 3-nerved, the nerves conspicuous; northwestern Argentina and southern Bolivia . . . . . *P. volcanensis*
3(1). Plants stoloniferous . . . . . *P. procurrens*
3′. Plants caespitose 4
4(3). Blades linear; axis of the branches of the inflorescence glabrous . . . . . *P. simplex*
4′. Blades linear-lanceolate to lanceolate; axis of the branches of the inflorescence usually pilose . . . . . *P. malacophyllum*

Acknowledgments. Fieldwork was carried out with grants from the National Geographic Society, #5657-96 and #6024-97. Laboratory work was done with a grant from Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET, #4440/96. We thank Vladimiro Dudás for preparing the excellent line drawing.

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Volume 10, Number 2, pp. 95–186 of NOVON was published on 30 June 2000.

Volume 10
Number 3
2000

NOVON

A New Species of *Aureliana* (Solanaceae) from Minas Gerais, Brazil

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ABSTRACT. The new species *Aureliana angustifolia* (Solanaceae) from a secondary forest of Juiz de Fora, in southeastern Brazil, is described. It is distinguished by its narrowly lanceolate leaves, by the brief and triangular calyx lobes, and by the subglobose fruits with a thin pericarp. The style length dimorphism with the lack of the stigmatic papillae on the short style suggests that it is an andromonoecious species.

Seven taxa were recognized in the revision of the genus *Aureliana* Sendtner by Hunziker and Barboza (1991). All are found in central-western, southeastern, and southern Brazil. Carvalho and Bovini (1995) added one additional species collected in Paraty, Rio de Janeiro. During a recent survey of Solanaceae, carried out in a Conservation Unit in the municipality of Juiz de Fora, Minas Gerais, in southeastern Brazil, another distinctive new species of *Aureliana* was discovered.

Aureliana angustifolia Alm.-Lafetá, sp. nov. TYPE: Brazil. Minas Gerais: Juiz de Fora, Reserva Biológica Santa Cândida, 29 May 1996 (fl, fr), *R. C. Almeida-Lafetá & F. A. P. L. Costa 95* (holotype, CESJ; isotypes, MO, R, RB). Figure 1.

Frutex 2–3 m altus; ramis dichotomis. Folia geminata inaequalia, lanceolata, angusta, chartacea, adaxaliter glabrata, abaxaliter pubescentia trichomatibus simplicibus eglandulatis. Inflorescentae 5- ad 8-fasciculatae. Flos calyce campanulato, laciniis triangularibus brevibus; corolla alba, maculis viridibus ornata; filamentis ca. 1.5 mm longis, antheris ca. 1 mm longis. Fructus subglobosus, pericarpio tenui; seminibus reniformibus.

Shrub 2–3 m high, branches dichotomous, puberulent, with simple, eglandular trichomes on the leaves and the stem. Sympodial units difoliate, with unequal size. Leaves chartaceous, narrowly lanceolate, the larger difoliate one 13–28 × 1.5–2 cm, the smaller 4–6 × ca. 1 cm wide, blade slightly asymmetric, apex acute to acuminate, base acute; adaxial blade glabrate, abaxially puberulent, with simple trichomes; petiole 3–5 mm long. Inflorescence 5- to 8-fasciculate, axillary. Pedicel ca. 7 mm long, apically inflated. Calyx campanulate, with triangular lobes less than 1 mm long, hirsute externally, with simple eglandular trichomes. Corolla white, with green maculae, 10–12 mm diam., rotate stellate, the lobes 4–5 mm long, lanceolate, with simple, eglandular trichomes abaxially and glandular trichomes adaxially, margins ciliate. Anthers ca. 1 mm long, basifixed, filaments ca. 1.5 mm long. Ovary ca. 1 mm long; styles with two sizes, in long-styled flowers ca. 3 mm long and in short-styled flowers ca. 1 mm long. Fruit subglobose, ca. 7 mm wide and ca. 6 mm high, thin pericarp, fruiting pedicels apically inflated and erect. Seeds ca. 10 per fruit, reniform, 3–4 mm long, with reticulate testa.

The style length dimorphism, evident on all specimens of *Aureliana angustifolia* examined, also occurs in the other *Aureliana* species (Hunziker & Barboza, 1991). This character is common in the related genus *Athenaea* (Barboza & Hunziker,

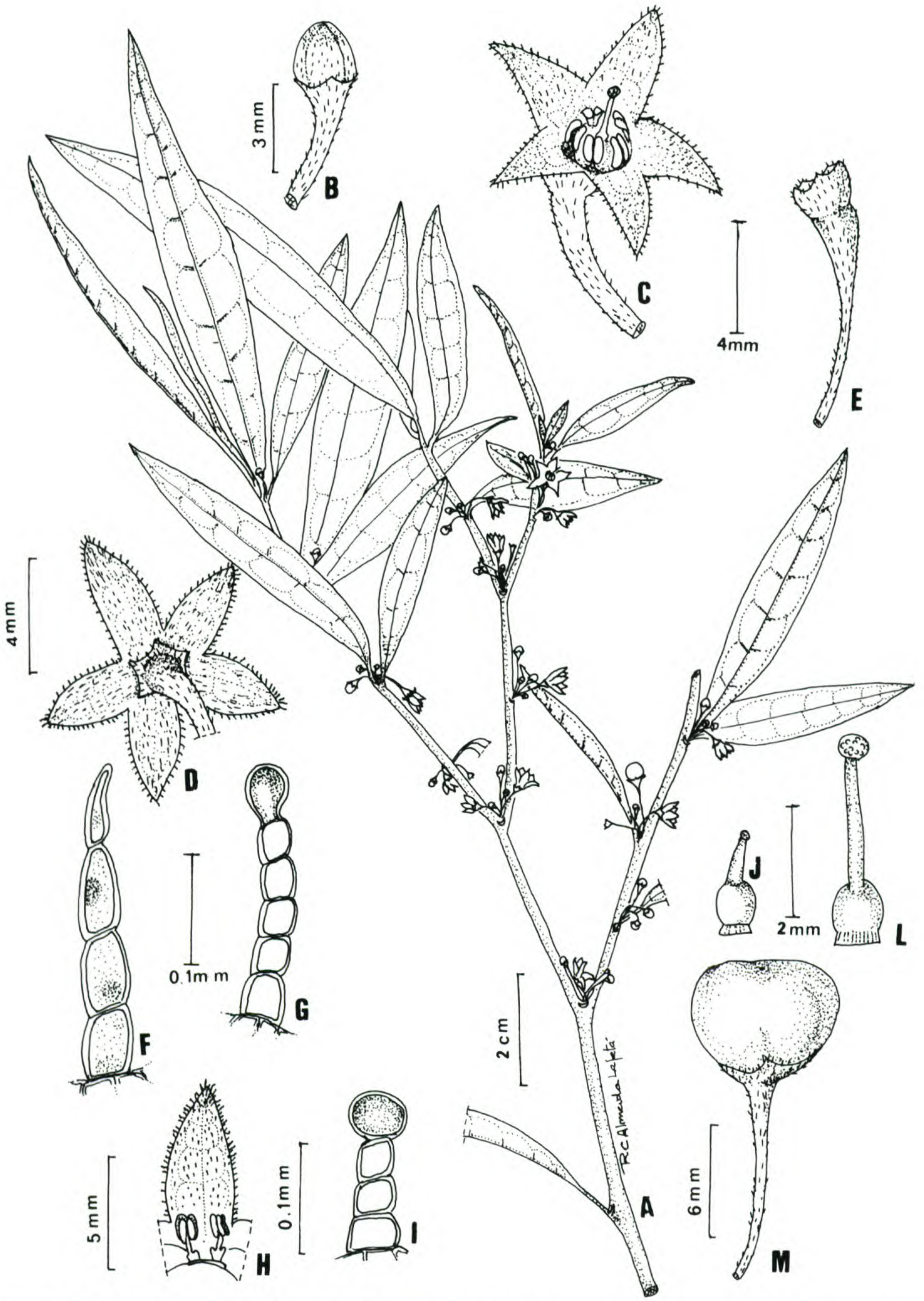

Figure 1. *Aureliana angustifolia* Alm.-Lafetá (holotype). —A. Branch with flowers and fruits. —B. Bud. —C. Flower, adaxial view. —D. Flower, abaxial view. —E. Calyx and pedicel. —F. Eglandular trichome from the abaxial face of the corolla. —G. Trichome from the margin of the corolla. —H. Section of the corolla with two stamens. —I. Glandular trichome from the adaxial face of the corolla. —J. Short-styled pistil. —L. Long-styled pistil. —M. Fruit.

1989) and several *Solanum* species. The lack of stigmatic papillae on the short style suggests that *Aureliana angustifolia* is an andromonoecious species. In the Solanaceae family, andromonoecy is widespread most notably in *Solanum* (Whalen, 1984).

The type specimen was collected in fragmented secondary forest at 950 m, in light shade, from a population of scattered individuals. *Aureliana angustifolia* is restricted in distribution and until now has been collected only at two localities in Minas Gerais. The sympatric taxon *A. fasciculata* (Vellozo) Sendtner var. *fasciculata* is disseminated throughout southeastern Brazil.

Aureliana angustifolia is distinguished by its narrowly lanceolate leaves to 28 cm long, its brief, triangular calyx lobes, and subglobose fruits having a thin pericarp. The specific epithet refers to the leaf shape.

Paratypes. BRAZIL. **Minas Gerais:** Viçosa, 1934 (fl), *José de Castro s.n.* (VIC 1753); Juiz de Fora, Reserva Biológica Santa Cândida, 2 Nov. 1998 (fl), *R. C. Almeida-Lafetá 512* (CESJ, R); Reserva Biológica Santa Cândida, 20 May 1999 (fl, fr), *R. C. Almeida-Lafetá 525* (BHCB, CESJ, RFA, VIC); Reserva Biológica Santa Cândida, 23 May 1999 (fl, fr), *R. C. Almeida-Lafetá 526* (BHCB, CESJ, MO).

Acknowledgments. I thank Lúcia d'A. Freire de Carvalho of the Jardim Botânico do Rio de Janeiro (JBRJ) and João Renato Stehmann of the Universidade Federal de Minas Gerais (UFMG) for their advice and encouragement. I thank Leopoldo Krieger of the Centro de Ensino Superior de Juiz de Fora (CES) for the Latin description, the curators at BHCB, CESJ, R, RB, RFA, SP, and VIC for access to specimens, and Daniel Stockdell for revising the English text.

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Two New Subspecies of *Hibiscus trilobus* (Malvaceae) from Central and South America

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ABSTRACT. *Hibiscus trilobus* subsp. *hirsutus* from Belize and Guatemala is described as new, based on differences in pubescence, leaf form, and phytogeography. The new combination *H. trilobus* subsp. *ingratus* is also made, based on *H. ingratus* Miquel. A key is provided to distinguish the three recognized subspecies.

In preparing a treatment of the Malvaceae for *Flora Mesoamericana*, the second author became aware that one taxon that pertains to the area, herein treated as a subspecies of *Hibiscus trilobus* Aublet, did not as yet have a name. Although the plant was recognized as distinct by Blanchard (1976), who treated *H. trilobus* as comprising three subspecies from Surinam, the Caribbean (Jamaica, Hispaniola, and Puerto Rico), and Central America (Belize and Guatemala), the names for these subspecies have not previously been effectively published. The present paper intends to rectify that omission and make the names available.

Hibiscus trilobus subsp. **hirsutus** O. J. Blanchard & Fryxell, subsp. nov. TYPE: Guatemala. Petén: La Libertad and vicinity, 10 May 1935, *M. Aguilar 486* (holotype, NY; isotypes, F, F photo 56202, LL). Figure 1.

Ab *Hibisco trilobo* subsp. *trilobo* et subsp. *ingrato* foliis minus profunde 3–5(raro 7)-lobis, indumento pilorum erectorum tenuium simplicium 2–4 mm longorum distinguendus, pubescentia densissima hirsuta petiolis pedicellis bracteis involucralibus et calyci dimidio inferiore.

Shrubs or subshrubs 2 to 5 m tall, the stems with stout, often bulbous-based prickles, simple hairs 3 to 4 mm long, and also longitudinal lines of smaller, denser hairs. Leaves cordate, crenate-serrate, up to 14 cm long, 15 to 17 cm wide, broadly and shallowly 3- to 5-angled or -lobulate (rarely 7-lobulate), acuminate, sparsely hirsute above and beneath with simple hairs 1 to 3 mm long, these denser on principal veins; petioles 5 to 12 cm long, hirsute, with occasional prickles, and with the adaxial side densely puberulent; stipules subulate, 4 to 5 mm long, hirsute. Peduncles solitary in the leaf axils, shorter than to longer than subtending petiole, lacking prickles, densely hirsute, these patent hairs 3 to 4 mm long; involucellar bracts ca. 14, 14 to 16 mm long in flower, to 25 mm long in fruit, linear, hirsute; calyx 2 cm long in flower to 5 cm long in fruit, ± cylindric, prominently 20-ribbed, accrescent (inflated) in fruit, densely hirsute (hairs 2 to 4 mm long and spreading), the shallow lobes acuminate; petals 5 to 11 cm long, pink (yellowish in sicco) with darker base; staminal column ca. half length of petals, the anthers purplish; styles 5, essentially glabrous, with capitate stigmas. Capsules 2 to 3.5 cm long, enclosed in persistent calyx, hispid, these hairs 4 mm long; seeds 3.5 to 4 mm, short-pubescent, the hairs rusty-red.

Two of the collections cited for *Hibiscus trilobus* subsp. *hirsutus* (*Aguilar 486* and *Proctor 30054*) were originally distributed as *Hibiscus diversifolius* Jacquin, so additional duplicates of these collections might be found in other herbaria filed under the latter name.

The distribution of the three subspecies, as indicated in the following key, is mapped by Blanchard (1976: 280, fig. 10), and a photograph of the holotype of *H. trilobus* subsp. *hirsutus* is reproduced (Blanchard, 1976: 346, fig. 43).

Paratypes. BELIZE. Toledo, s.l., 25 Jan. 1929, *Stevenson 88* (F); Cayo, Chiquibul Forest Reserve, vicinity of Caracol Ruins, in ruined Mayan reservoir, 1500 to 1700 ft., 24 Apr. 1969, *Proctor 30054* (IJ, LL, MO). GUATEMALA. **Petén:** San Antonio, 13 km camino Libertad, Flores, 14 Feb. 1970, *Tún Ortíz 713* (MICH, US).

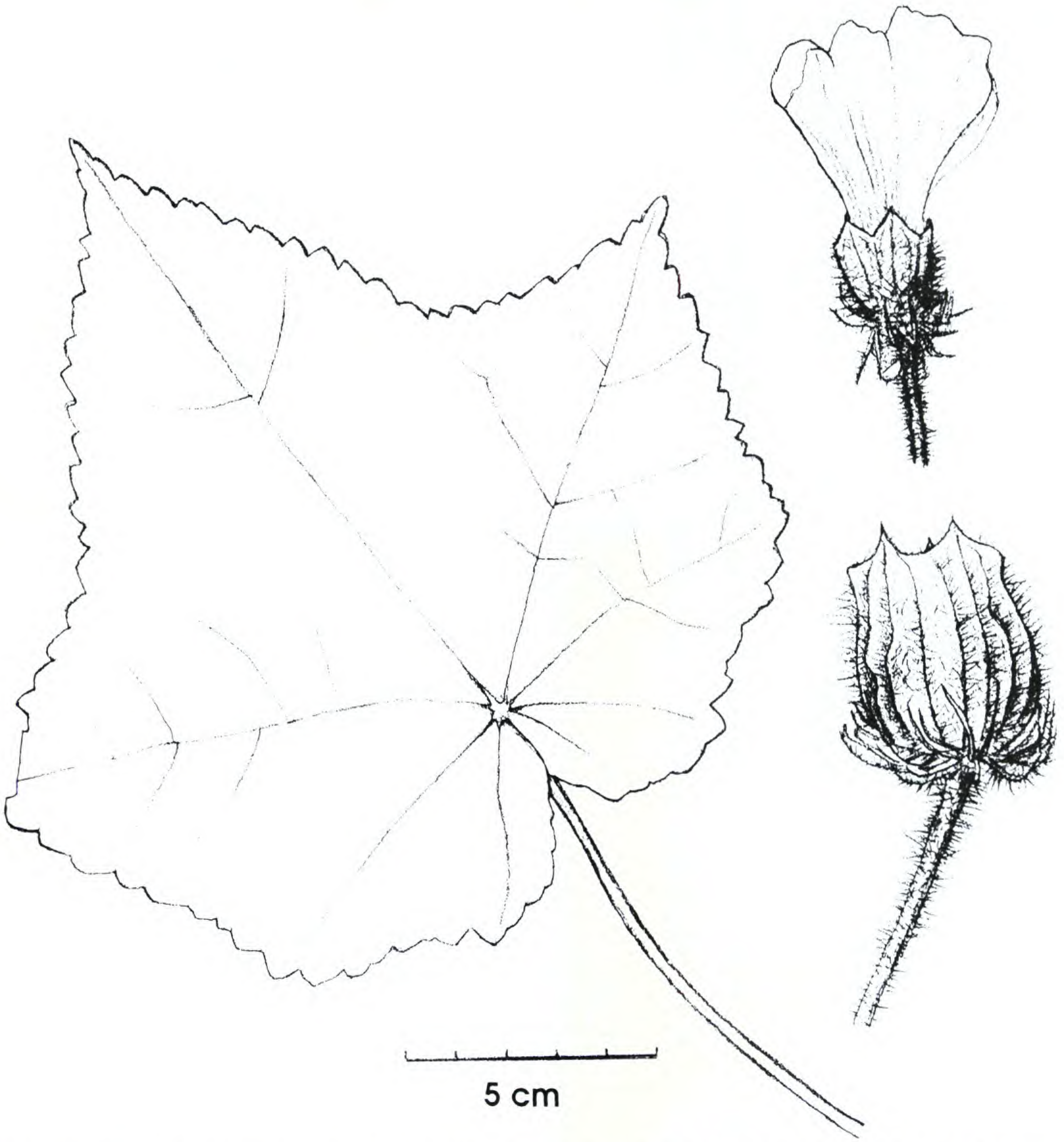

Figure 1. *Hibiscus trilobus* subsp. *hirsutus* O. J. Blanchard & Fryxell. Left: maximally developed leaf (pubescence omitted); right: calyx at anthesis (above) and in fruit (below), showing the nature of the pubescence and the degree of accrescence. [Drawings based on *Aguilar 486* (LL) and *Proctor 30054* (LL). Drawn by P. A. Fryxell.]

Hibiscus trilobus subsp. **ingratus** (Miquel) O. J. Blanchard & Fryxell, stat. et comb. nov. Basionym: *Hibiscus ingratus* Miquel, Linnaea 19: 143. 1847. TYPE: Surinam ("prope Paramaribo juxta rivulum"), *Focke s.n.* (lectotype, here designated, K).

The three taxa treated in the key (below) are geographically disjunct and morphologically distinct, but they are sufficiently similar that they are best grouped as subspecies of a single species. As precedent, Kearney (1955, 1957) included material from the "West Indies, Guiana" in *Hibiscus trilobus*, evidently in reference to what is here treated as subspecies *trilobus* and subspecies *ingratus*, respectively. However, Kearney (1957) also distinguished *H. ingratus* from *H. trilobus* and cited the former as from "Guiana and perhaps in Brazil," leaving the matter in some confusion. Blanchard (1988) published *Hibiscus* sect. *Striati* O. J. Blanchard to include this species and *H. striatus*. Each of these two species comprises three subspecies. Specimens may be reliably keyed to *H. trilobus* us-

ing the key in Kearney (1955) and to the subspecies of *H. trilobus* using the following key, which is slightly modified from Blanchard (1976: 199 in unpublished dissertation). Blanchard distinguished the three subspecies of *H. trilobus* on characters of pubescence, leaf shape, and size and number of involucellar bracts, as is indicated below.

1a. Pubescence on the calyx, pedicel, and young stem spreading-hirsute, the hairs 2 to 4 mm long; leaves 3 to 5 (to rarely 7)-angulate or -lobulate; Guatemala and Belize . . . . . *H. trilobus* subsp. *hirsutus*

1b. Pubescence on the calyx appressed to erect but never hirsute, the hairs of the young stem and pedicel short; leaves 3- to 5-lobed, the lobes acute to acuminate.

2a. Involucellar bracts 12 to 16 in number, 14 to 17(rarely 18) mm long in flower; leaves 3- or 5-lobed; Jamaica, Hispaniola, Puerto Rico . . . . . *H. trilobus* subsp. *trilobus*

2b. Involucellar bracts 8 to 11(rarely 12) in number, 18 to 30 mm long in flower; leaves mostly 3-lobed; Surinam . . . . . *H. trilobus* subsp. *ingratus*

Acknowledgments. The curators of the herbaria cited (F, IJ, LL, MICH, MO, NY, US) are thanked for lending specimens in their care or for facilitating visits to their herbaria.

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Mesoamerican Orchid Novelties 3

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ABSTRACT. Five new Mesoamerican species are described in the orchid genera *Chysis*, *Scaphyglottis*, and *Sobralia*. *Chysis addita* Dressler (Chiapas) and *C. orichalcea* Dressler (El Salvador), described here, are allies of *Chysis laevis* Lindley with shorter and wider segments; *C. addita* has laminar keels and winglike extensions on the column foot; the predominantly yellow *C. orichalcea* has convex lateral lip margins. The new species *Scaphyglottis bicallosa* Dressler (Costa Rica) has smaller, more numerous flowers than *S. amparoana* (Schlechter) Dressler and a higher, bilobed callus. Also new, *Scaphyglottis monspirrae* Dressler (Panama) has narrower leaves than *S. punctulata* (Reichenbach f.) C. Schweinfurth and a three-lobed lip. Another novel species, *Sobralia purpurea* Dressler (Costa Rica), has lanceolate leaves 1–2.5 cm wide and an intensely purple, oblong lip. The synonymy of *Chysis bruennowiana* Reichenbach f. & Warscewicz and the identity of *C. tricostata* Schlechter are discussed. New combinations are published for *Arpophyllum giganteum* subsp. *alpinum* (Lindley) Dressler, *A. giganteum* subsp. *medium* (Reichenbach f.) Dressler, and *Scaphyglottis pachybulbon* (Schlechter) Dressler.

This paper continues the descriptions of new species found in the preparation of the Orchidaceae for *Flora Mesoamericana* and new combinations needed for that treatment (Dressler, 1997, 1998). New species are described in the genera *Chysis*, *Scaphyglottis*, and *Sobralia*, and new combinations are published in *Arpophyllum* and *Scaphyglottis*.

ARPOPHYLLUM

Arpophyllum giganteum Hartweg ex Lindley, Ann. & Mag. Nat. Hist. 4: 384. 1840. TYPE: Mexico. Between Tonatze and Talea, April, *Hartweg s.n.* (holotype, K-L).

Arpophyllum giganteum subsp. **alpinum** (Lindley) Dressler, comb. nov. Basionym: *Arpophyllum alpinum* Lindley, Benth. Pl. Hartw.: 93. 1842. TYPE: Guatemala. In montibus Totonicapan, *Hartweg s.n.* (holotype, K-L).

Arpophyllum giganteum subsp. **medium** (Reichenbach f.) Dressler, comb. nov. Basionym: *Arpophyllum medium* Reichenbach f., Beitr. Orch.-K. C. Amer.: 89. 1866. TYPE: Guatemala. Las Nubes, 9 I 1857, *Wendland s.n.* (holotype, W).

The genus *Arpophyllum* is a small group of very similar species, with little variation in flower structure. Correll (1947) recognized only two species, *A. alpinum* and *A. spicatum* La Llave & Lexarza, differing in the length of the sepals, petals, and lip. *Arpophyllum spicatum*, the type of the genus, is quite distinctive in its thick, succulent leaves. As noted by Garay (1970, 1974), *A. laxiflorum* is also clearly distinct in its subentire lip and the puberulent surface of the ovaries. Garay recognized five species, with *A. medium* being intermediate between *A. giganteum* and *A. alpinum*. While the aspects of typical *A. alpinum*, *A. giganteum*, and *A. medium* are distinctive, there is much variation, with the limits between *A. medium* and the other two being unclear, though *A. alpinum*, of high elevations, cannot be confused with *A. giganteum*, of low elevations. As *A. medium* is intermediate between these and I find no feature that will consistently distinguish it from either extreme, I am compelled to treat all three as subspecies of *A. giganteum*.

KEY TO THE SPECIES AND SUBSPECIES OF *ARPOPHYLLUM*

1. Ovary and rachis sparsely glandular-puberulent, without black scales or trichomes 2
1′. Ovary and rachis with prominent black scales and trichomes 3
2(1). Leaves fleshy, canaliculate, cannot be flattened without breaking . . . . . *A. spicatum* La Llave & Lexarza
2′. Leaves leathery, not canaliculate, easily flattened . . . . . *A. laxiflorum* Pfitzer
3(1). Lateral sepals 4–5 mm long; column less than 3 mm; leaves usually more than 2.5 cm wide; inflorescence 10–16 × 1.8–2.5 cm . . . . . *A. giganteum* subsp. *giganteum*
3′. Lateral sepals 6–9 mm long; column usually 3 mm or more; leaves up to 2.5 cm wide; inflorescence either shorter *or* wider than above . . 4
4(3). Inflorescence 3–7 cm long . . . . . *A. alpinum* subsp. *alpinum*

4′. Inflorescence 6–10 cm . . . . . *A. alpinum* subsp. *medium*

CHYSIS

The genus *Chysis* is generally scarce both in the field and in herbaria. Its scarcity in herbaria may be due, in part, to the thick pseudobulbs and the large, fleshy flowers. A further problem is that flowers pressed when old and wilted are slow to rehydrate. Storing them in alcohol for two or three weeks may be necessary. Hooker (1861) felt the "structure of flowers, pseudobulbs, and foliage" of *C. limminghei* to be "identical with the others." As far as known, all *Chysis* lips have three or five larger keels and usually two to several smaller, lateral keels. Paul Allen (1955), following Hooker and others, chose the keels as the primary feature in classification and reduced *Chysis* to two species and several varieties, depending on the presence of 5 large and 2 smaller keels in *C. aurea*, or, in *C. laevis*, 3 large and 2 smaller keels. This system (Allen, 1955) ignores significant differences in the keels and in other features, but was used for many years, partly because so little material of the genus is available. The two new species described here are both allies of *C. laevis*, having thick pseudobulbs and smooth keels on the lip. Another plant, more similar to *C. aurea* and painted by Rodríguez C., is also clearly undescribed, but I have seen no pressed material of the species (Rodríguez C. et al., 1986). There are plants, apparently of this species, in cultivation, and I believe its description should wait until specimens are available.

Chysis addita Dressler, sp. nov. TYPE: Mexico. Chiapas: Cintalapa, epiphytic, moist ridge with *Pinus*, *Quercus*, and *Liquidambar* and Montane Rain Forest between Colonia Francisco I. Madero and Colonia A. López Matéos, elev. 1250 m, flowers yellow and maroon, 31 Dec. 1980, *D. E. Breedlove 49026* (holotype, CAS). Figure 1A–D.

Chysis laevi Lindley similis sed segmentis brevioribus, latioribus, callo 3 lamellis instructo, pede columnae ornato.

Roots felty, 1.5–3 mm diam.; stems caespitose, more than 23 cm long, clavate, long-stipitate; leaves several, petioles 3–3.5 cm long, blades elliptic, 18–20 × 3.2–4 cm, acuminate; inflorescence ca. 15 cm long, peduncle 12–13 cm long, rachis ca. 3 cm long, with 3 flowers (in type), floral bracts ovate, concave, acute or apiculate, ca. 9–10 × 4–6 cm; ovary and pedicel 23 mm long; dorsal sepal narrowly obovate, obtuse, 25 × 13 mm; lateral sepals oblong-ovate, apically oblique, subacute, 22 × 16.7 mm; petals cuneate-obovate, falcate, 27 × 8–10 mm; lip 3-lobed, 20 × 31 mm, base cordate, lateral lobes obliquely ovate, obtuse, 8–9 × 8 mm; midlobe broadly flabellate with raised veins, margins undulate, 7 × 15 mm; base of lip glabrous, keels 3, not reaching base of midlobe, basally low, distally forming 3 rounded lamellae 5–6 × 1.5–2 mm; column 12–13 mm long, column foot 10 mm long, with rounded lateral lobes near apex, with a small appendix or callus between column foot and base of lip.

This species resembles *C. laevis* in having three large keels on the lip, but the keels are laminar, rather than thick and fleshy. The flower parts are all shorter and proportionately wider than in *C. laevis*. The most distinctive features of the species are found on the column foot. The foot has small, rounded wings beyond the middle, and distal to the wings there is a curious appendix between the column foot and the lip. The epithet, *addita*, refers to this appendix or addition. This very distinctive species is known only from the type but should appear elsewhere in Chiapas and in Guatemala.

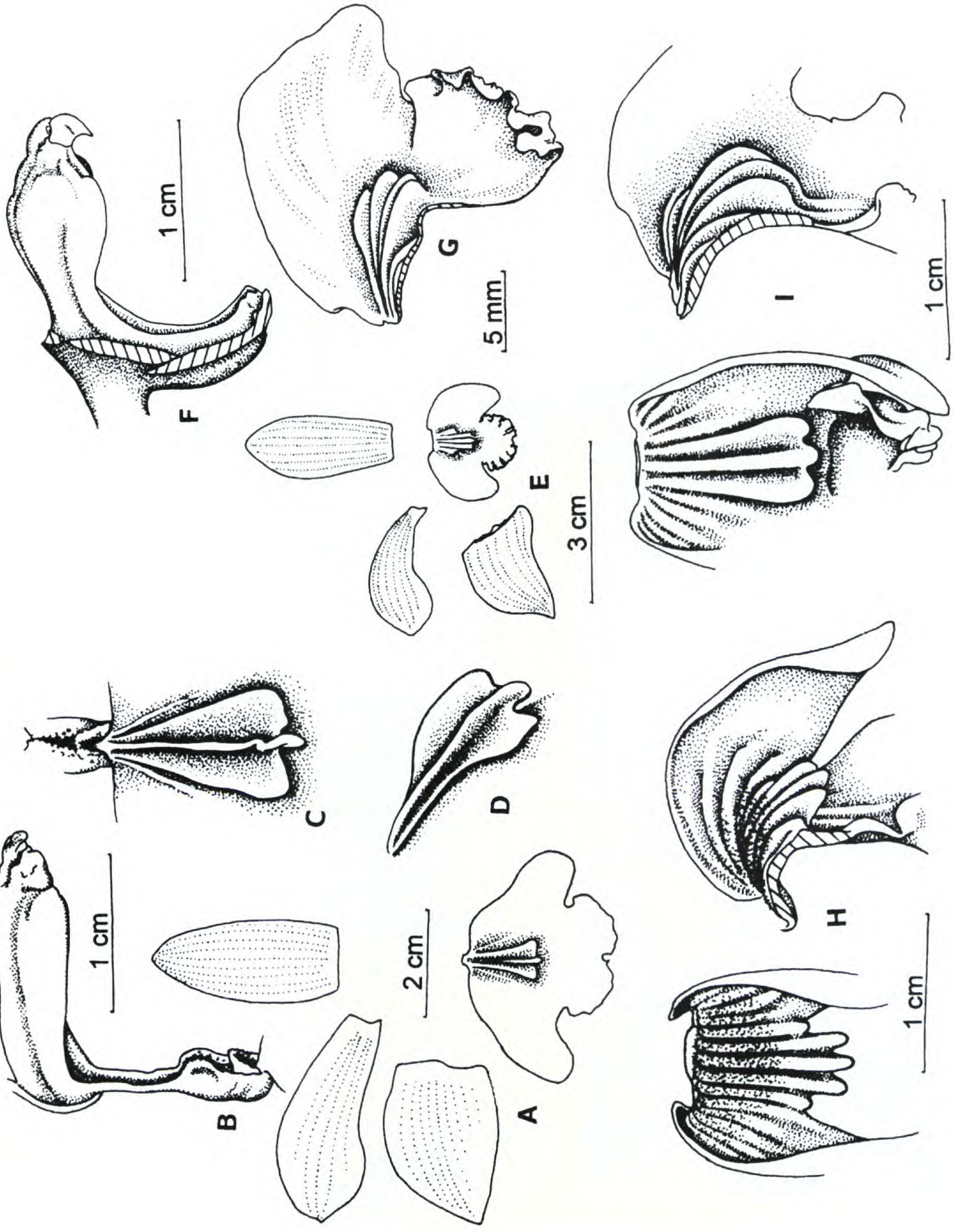
Chysis orichalcea Dressler, sp. nov. TYPE: El Salvador. Cerro Los Naranjos, 1850 m elev., Mar., *F. Hamer 162* (holotype, AMES; isotype, SEL). Figure 1E–G.

Chysis laevi Lindley similis sed segmentis brevioribus, latioribus, labello rotundato differt.

Roots felty-pilose, 1.5–4 mm diam.; pseudobulbs 20–26 × 2–3 cm, clavate. Leaves several, 10–40 × 2–7 cm (including short petioles), elliptic, acuminate. Peduncle 12–20 cm, raceme 3–12 cm, several-flowered, floral bracts lance-ovate, acute, 12–15 × 4–6 mm; ovary and pedicel 30–33 mm; flowers yellow or yellow-orange, sepals and petals marked with red stripes; dorsal sepal obovate-oblong, obtuse, 26–32 × 10–13 mm; laterals falcate-

→

Figure 1. A–D. *Chysis addita* Dressler (*Breedlove 49026*). —A. Perianth parts, flattened. —B. Lateral view of column. —C, D. Two views of callus. E–G. *Chysis orichalcea* Dressler (*Hamer 546*). —E. Perianth parts, flattened. —F. Lateral view of column. —G. Lip and callus, the near lateral lobe lost. —H. *Chysis bruennowiana* Reichenbach f. & Warscewicz (liquid material of cultivated plant), two views of callus. —I. *Chysis tricostata* Schlechter (*Horich 60-7-43*), two views of callus.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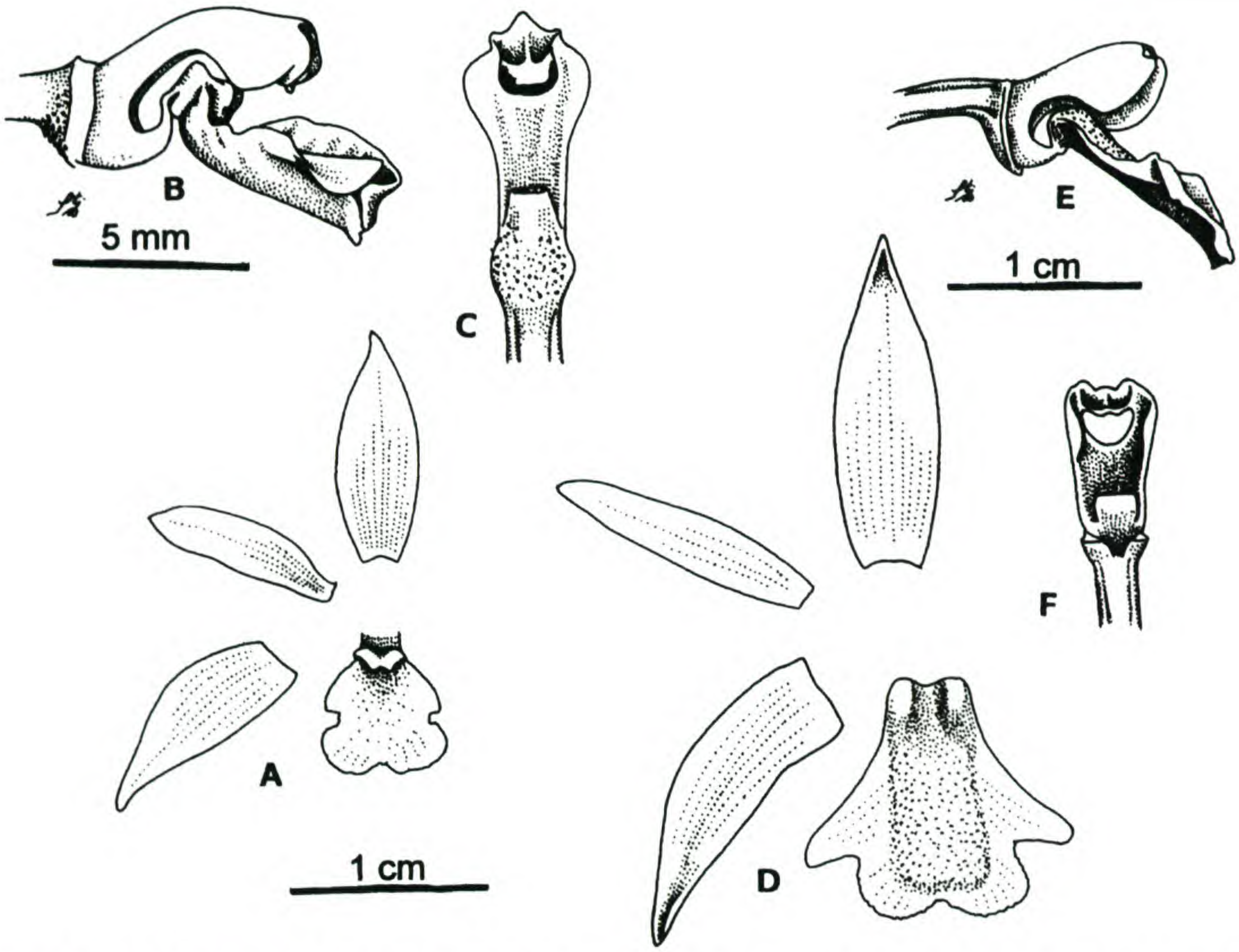

Figure 2. A–C. *Scaphyglottis bicallosa* Dressler (*Lankester 978*). —A. Perianth parts, flattened. —B. Lateral view of column and lip. —C. Ventral view of column. D–F. *Scaphyglottis amparoana* (Schlechter) Dressler (*Dressler 5577*). —D. Perianth parts, flattened. —E. Lateral view of column and lip. —F. Ventral view of column.

ovate, 23–27 × 11–14 mm; petals spatulate, falcate, 25–30 × 7–13 mm, blades obovate, obtuse; lip 15–19 × 25–30 mm, 3-lobed, lateral lobes oblong, obtuse, ca. 11 × 9 mm; midlobe transversely oblong, ca. 10 × 11 mm, margins undulate, base broadly rounded, with 3 major keels and 2 much shorter, glabrous, apices rounded; column ca. 11 mm, with foot 7–8 mm.

Chysis orichalcea also resembles *C. laevis* but differs in having shorter and wider perianth segments and in the strongly convex lateral margins of the lip (when flattened). Like *C. addita*, this species has something of a callus at the tip of the column foot; a similar, though smaller, callus may sometimes be found in *C. laevis*. The epithet *orichalcea* is derived from the Latin *orichalcum*, chalcopyrite or fool's gold. Though the flowers of this species are quite golden, it is not the real *C. aurea*, whose thick, puberulent, subequal keels diverge distally.

Paratype. EL SALVADOR. Boquerón del Volcán San Salvador, forest No. slope, 1800 m elev., 31 Mar. 1976, *Hamer 546* (AMES).

Working Key to Known Species of *Chysis*

1a. Base of lip puberulent; major keels of lip 5, subequal or lateral keels shorter; base of lip tapering to point of attachment.
  2a. Keels free, parallel, not forming large, raised callus.
    3a. Keels thick, fleshy, diverging distally . . . . . *C. aurea*
    3b. Keels laminar, not fleshy, parallel . . . . . Rodríguez painting
  2b. Keels united to form a large, raised, fleshy callus with porrect apex.
    4a. Keels markedly unequal, 3 median keels much longer than 2 lateral keels, projecting forward 2–3 mm from distal attachment; pseudobulbs slender, 1–1.5 cm wide, flexible . . . . . *C. bruennowiana*
    4b. Keels 5, subequal; pseudobulbs 1.5–4 cm thick, not flexible.
      5a. Sepals and petals white; some floral bracts as much as 2.5 cm long, ovate, conspicuous; pseudobulbs clavate, distinctly stipitate . . . . . *C. bractescens*
      5b. Sepals and petals marked with purple; floral bracts 10–15 mm long, inconspicuous; pseudobulbs oblong

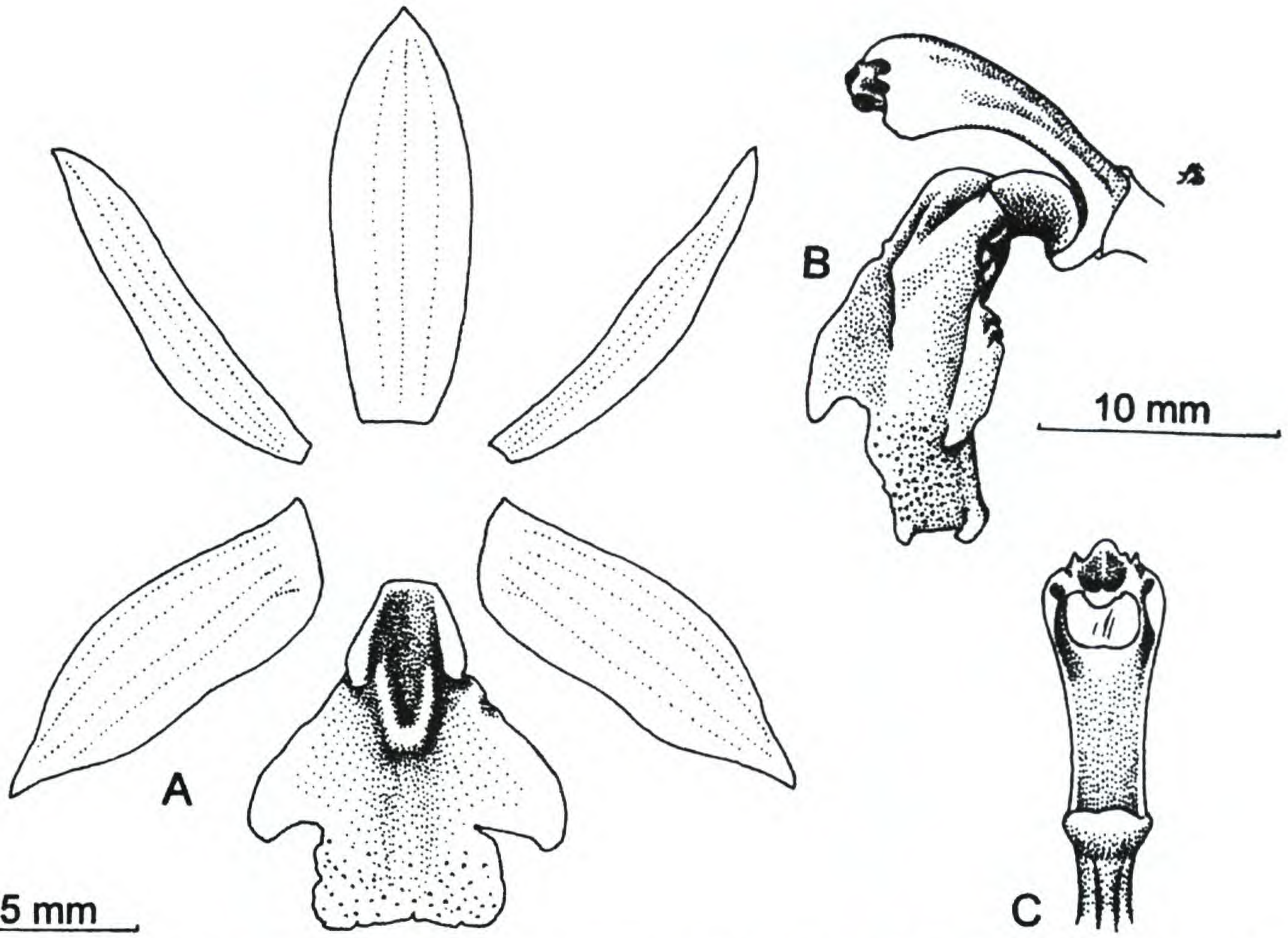

Figure 3. *Scaphyglottis monspirrae* Dressler (*Dressler 5668*). —A. Perianth parts, flattened. —B. Lateral view of lip and column. —C. Ventral view of column.

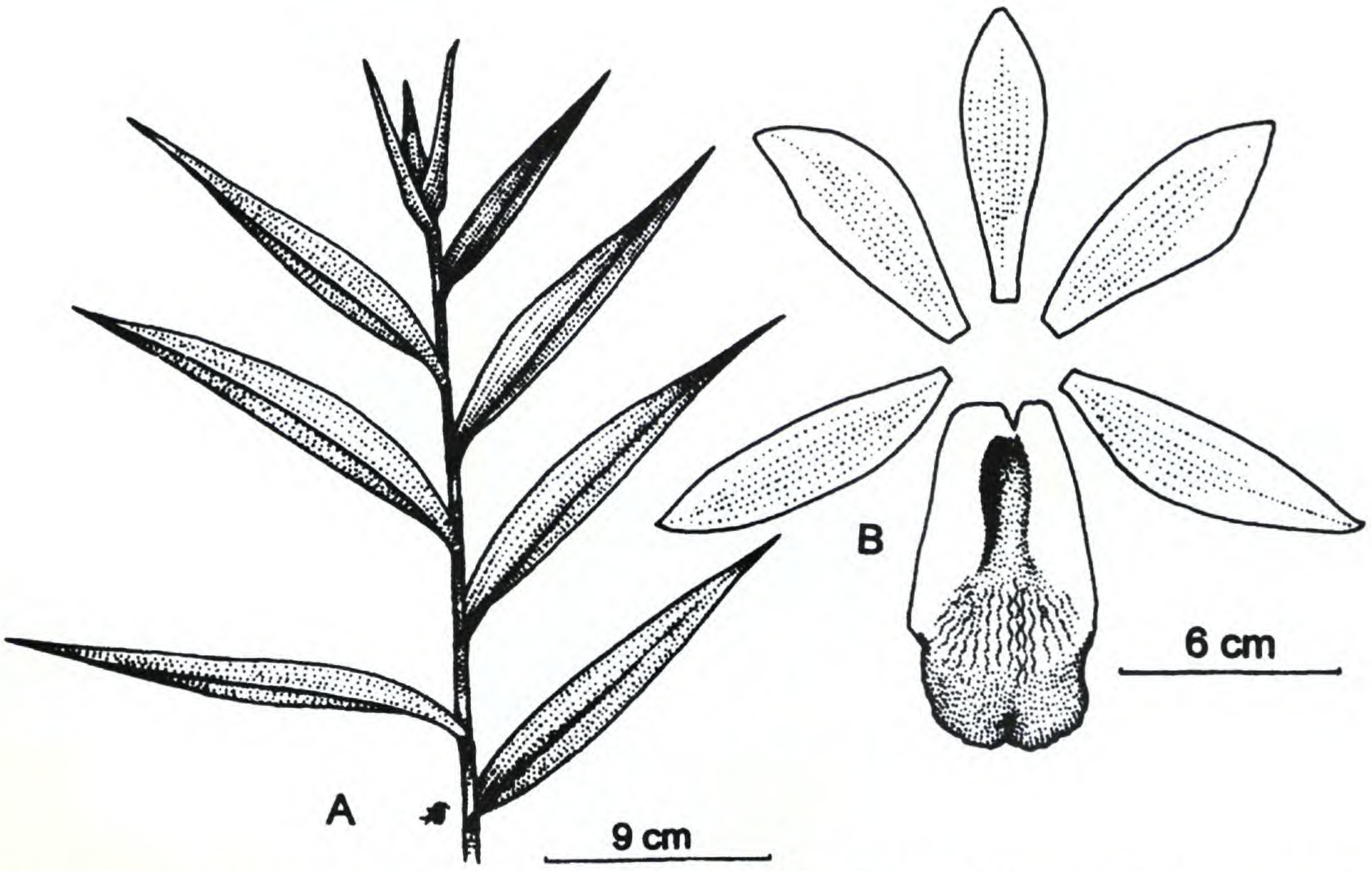

Figure 4. *Sobralia purpurea* Dressler (*Mora & Quirós s.n.*). —A. Part of stem with leaves and inflorescence bracts. —B. Perianth parts, flattened.

or ellipsoid, sessile or short-stipitate . . . . . *C. limminghei*

1b. Base of lip glabrous; major keels 3 or 5, markedly unequal if 5; base of lip broadly rounded or subtruncate.

6a. Appendix present between column foot and lip; column foot with distinct wings; keels laminar . . . . . *C. addita*

6b. Appendix lacking; column foot without wings or these minute, keels fleshy.

7a. Dorsal sepal 3.5–4 cm long; lateral lobes of lip distinctly shorter than midlobe, lateral margins straight or shallowly concave in basal 1/2 to 2/3 . . . *C. laevis*

7b. Dorsal sepal 2.6–3 cm long; lateral lobes of lip subequal to midlobe, lateral margins prominently convex throughout . . . . . *C. orichalcea*

Chysis bruennowiana Reichenbach f. & Warscewicz, Bot. Zeit. 15: 157. 1857. TYPE: Peru. *Warscewicz*, cult. Brünnow (W).

Chysis aurea var. *maculata* Hooker, Bot. Mag. 77: t. 4576. 1851. *Chysis maculata* (Hooker) Fowlie, Orchid Digest 35: 86. 1971. Syn. nov. TYPE: Colombia. Cult. *Lucombe & Pince* (K-L?).

Chysis costaricensis Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 19: 297. 1923. Syn. nov. TYPE: Costa Rica. Alajuela: Forêts de San Ramon, alt. 1500–1600 m, mai 1913, *A. Tonduz 17631* (CR).

The plants called *Chysis costaricensis* or *C. maculata* in Central America are indistinguishable from the South American *C. bruennowiana*, which is more similar to *C. aurea* Lindley than to the other named species of Central America (see Fig. 1H).

Chysis tricostata Schlechter, Notizbl. Bot. Gart. Berlin-Dahlem 8: 123. 1923. TYPE: Cult. Bot. Gart. Berlin-Dahlem, "wahrscheinlich Central America" (B destroyed, Schlechter sketch at AMES).

Though Fowlie (1971) published on Central American *Chysis* and interpreted plants from the Río Birris Canyon, in Costa Rica, as *C. tricostata*, none of his material was preserved. I have seen no good material of *C. tricostata*, but Schlechter's sketch of the type specimen (AMES) agrees well with Fowlie's characterization and with a flower from a Horich collection also from the valley of the Río Birris (MO accession 60-7-43, Fig. 1I). The absence of small lateral keels in addition to the three large keels in the Schlechter sketch of the type may be an oversight. I would prefer not to select a lectotype or a neotype without better material than is now available. Whether *C. tricostata* is an extreme form of *C. laevis* or a distinct species cannot be determined without more and better material.

SCAPHYGLOTTIS

The taxonomy of *Scaphyglottis* is in relatively good order because of Adams's (1993) recent revision, but several novelties have appeared since the revision.

Scaphyglottis bicallosa Dressler, sp. nov. TYPE: Costa Rica. Cartago: Navarro, flowered at Las Cóncavas, 10 Apr. 1925, *C. H. Lankester 978* (holotype, AMES). Figure 2A–C.

Scaphyglottis amparoanae (Schlechter) Dressler similis, sed floribus minoribus et multioribus, labello panduratoobovato, basi alte bicalloso differt.

Epiphytic, to at least 45 cm tall; roots smooth, whitish, 0.5–1.5 mm diam.; basal stems 15–23 cm long, with several levels of superposed shoots decreasing in size upward; stems stout but not pseudobulbous, to ca. 5 mm diam., basally covered by verrucose, tubular sheaths; leaves 2, apical, ligulate, 9.5–21 × 0.7–1.2 cm, apically asymmetrically retuse; inflorescence terminal, from a cluster of several bracts, the bracts to 21 × 6 mm, the outer bracts verruculose; raceme 5–6 cm long, fractiflex, with 6–8 flowers; floral bracts 16–21 × 7–13 mm, elliptic, keeled, caducous; sepals and petals greenish buff, lip white with chrome yellow blotch; ovary and pedicel 14–27 mm long; dorsal sepal elliptic, acute, 9–11.5 × 3.6–4 mm, keeled distally; lateral sepals elliptic-lanceolate, subacuminate, 10–12 × 3.4–3.7 mm, keeled distally; petals oblong or lanceolate-oblong, basally cuneate, apiculate, 8.5–10.5 × 2.2–2.5 mm; lip 3-lobed, ca. 5 × 5.5 mm, basally short unguiculate, attached to column foot, sharply bent near base, the bend with 2 high calli, blade obovate, the lateral lobes ca. 1 mm long, midlobe transversely oblong, shallowly retuse, 2 × 5.5 mm; column ca. 5 mm long, arcuate, winged, with a prominent, concave foot, the free portion ca. 1.5 mm long, porrect and curving upward to base of lip.

This species is closely allied to *Scaphyglottis amparoana* (Schlechter) Dressler, from which it differs in the smaller, more numerous flowers, and especially in the column foot and the base of the lip. In *S. amparoana* the column foot is porrect, and the blade of the lip is thickest basally, slightly sulcate, and gradually thinner toward the apex (see Fig. 2D–F). In *S. bicallosa* the column foot bends somewhat upward and the base of the blade is bent upward and again downward, with a thick, twoparted callus at the bend. The proportions of the lip and column also suggest that these are distinct species. Noting that the description of *Costaricaea*

amparoana (Schlechter, 1923: 31) indicated relatively small flowers, Adams (1993) apparently feared that the material of *S. bicallosa* might actually correspond to the type of *S. amparoana*. I have examined other specimens of *S. amparoana* from the type locality, La Palma de San José, and while they do have smaller flowers than most other *S. amparoana*, they are larger than the flowers of *S. bicallosa* and they do not show the other distinctive features of that species. Schlechter's sketch of the lip of *S. amparoana* (at AMES) suggests an imperfectly rehydrated flower, but the lip is still quite unlike that of *S. bicallosa*.

Paratype. COSTA RICA. **Cartago:** La Fuente, 1200 m, 9 Apr. 1925, *A. Alfaro 72* (AMES, US).

Scaphyglottis monspirrae Dressler, sp. nov. TYPE: Panama. Darién: Cerro Pirre, elev. 1200–1400 m, 15–16 July 1977, *R. L. Dressler 5668* (holotype, MO). Figure 3.

Scaphyglottis punctulatae (Reichenbach f.) C. Schweinfurth similis, sed foliis angustioribus, labello profunde trilobato differt.

Epiphytic, 20–50 cm tall, with 2 or 3 levels of superposed shoots, with the stems decreasing in size upward; stems slender, not forming distinct pseudobulbs; roots 0.5–1 mm diam., whitish, smooth; basal stems 24–36 cm long, with striate sheaths bearing persistent leaf blades similar to the apical leaves; apical leaves 2, lanceolate-ligulate, tapering, narrowly retuse, 9–18.5 cm × 5–7 mm; sepals and petals brownish green, lip cream; ovary and pedicel 15–20 mm long; sepals elliptic or oblong, acute, 9–9.5 × 2.3–3 mm; petals narrowly elliptic or lanceolate, acute, 9–9.5 × 1.7–4 mm; lip 3-lobed, 9–10 × 7–9 mm, with low U-shaped callus near base of blade, base articulate to column foot, broadly cuneate with erect margins, lateral lobes antrorse-triangular, rounded, 1 × 1.8 mm, midlobe subquadrate, subtruncate, 2.3 × 4.2 mm, verruculose; column 5–5.5 mm long, arcuate, winged distally, the wings rounded-triangular, somewhat antrorse, column foot prominent, ca. 1.5 mm long.

The presence of well-developed leaves at midstem suggests a close relationship between *S. monspirrae* and *S. punctulata* (Reichenbach f.) C. Schweinfurth, and especially with the form of *S. punctulata* that occurs in central Panama, without pseudobulbs and with many persistent lateral leaves. The distinctly 3-lobed lip suggests affinity with *S. triloba* B. R. Adams. Such a relationship cannot be discounted, though *S. triloba* has much wider leaves, a much narrower lip, and the lip and column foot are more distinctly "sigmoid" than in this or any other *Scaphyglottis* species, with the lip folding back on the column foot and then forward again on itself in a pronounced and compressed "Z." Both *S. monspirrae* and *S. triloba* are known from little material, and a more detailed comparison of the two must wait until better material is available. The epithet, *monspirrae*, refers to the type locality, Cerro Pirre.

Table 1. A comparison of *Scaphyglottis lindeniana* and *S. pachybulbon*.

	S. pachybulbon	*S. lindeniana*
Stipe	shorter than pseudobulb, usually thick	longer than pseudobulb, slender
Pseudobulb	thickest basally	subfusiform
Leaves	narrow, length = 6–10 × width	wider, length = 3–5 × width
Lip	widest below middle, white	middle subequal to apex, green
Base of lip (below bend)	shorter than blade	longer than blade

Scaphyglottis pachybulbon (Schlechter) Dressler, comb. nov. Basionym: *Hexadesmia pachybulbon* Schlechter, Repert. Spec. Nov. Regni Veg. Beih. 17: 26. 1922. TYPE: Panama. *C. W. Powell 229* (holotype, B destroyed; isotypes, AMES, MO).

Even with the removal of *Scaphyglottis pachybulbon*, of Costa Rica and western Panama, *S. lindeniana* remains a variable species ranging from Mexico to Bolivia. John Atwood finds *S. pachybulbon* to be sympatric with *S. lindeniana* in the area of Monteverde and considers them quite distinct (pers. comm.). Further, preliminary analyses of DNA suggest that *S. lindeniana* and *S. pachybulbon* are closely allied but distinct (Dressler, Williams & Whitten, in prep.). While no one feature is absolute in separating them, there are a number of features that, together, separate them quite well. The pseudobulbs are different in shape, the basal stipes are much shorter in *S. pachybulbon*, and the proportions of the lip are also distinctive. The only specimens about which I have any doubts are very poor or quite incomplete. The differences in proportion of both plant and flower are summarized in Table 1.

Sobralia

Sobralia purpurea Dressler, sp. nov. TYPE: Costa Rica. San José: Carretera Interamericana Sur, km 39, Casa Mata, entrada a San Cristóbal, 800 m, junio 1990, floreció en cultivo 19 Abril 1993, *Dora E. Mora & Carlos Quirós s.n.* (holotype, USJ). Figure 4.

Herba epiphytica vel terrestris, folia disticha, lanceolata, acuminata, flos terminalis, singulis vel successiva, sepalum dorsale oblanceolatum, sepala lateralia elliptico-lanceolata, labellum in basi convolutum, lamina expansa subquadrato-oblonga, retusa differt.

Plant ca. 1 m or more in height; leaves distichous, lanceolate, caudate-acuminate, 15–18 × 1.1–2.5 cm, sparsely lepidote beneath, texture papery, with 9 major veins (including marginal veins), sheaths striate, glabrous; inflorescence terminal, bract cluster ellipsoid, 5.5–6 cm long, bracts striate, sparsely lepidote distally; sepals oblanceolate, subobtuse, dorsal 7.5–8 × 2.1 cm, laterals 8.5–8.9 × 2–2.3 cm; petals narrowly ovate, subacute, 7–7.9 × 2.3–3 cm; lip subquadrate oblong, 8.5–9.5 × 4.5–4.9, apparently without keels; midlobe 3.3 × 4.2 cm, deeply retuse, somewhat crisped; column 3.3 cm, clavate.

This new species is distinctive in its narrow, caudate leaves of rather thin texture, in the nearly smooth inflorescence bracts, and especially in the narrow, suboblong lip, which is described as being intensely purple, or "casi nazareno." There is some uncertainty about the exact origin of the plant. One of the collectors remembers the plant as being found near Casa Mata, as recorded on the label, while the other remembers the plant as collected on the road between Empalme and Santa María de Dota. So far, we have been unable to re-collect the plant in either area, but the plants should stand out when in flower.

Acknowledgments. I am very much indebted to Stig Dalström for preparing the drawings of the new taxa, to Eric Hágsater and the staff of AMO for discussion of *Arpophyllum* and for the loan of useful material of *Chysis*, and to Roberto González Tamayo for help with the Latin diagnoses.

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Three New South American Species of *Randia* (Rubiaceae, Gardenieae)

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ABSTRACT. Three new species of South American *Randia* (Rubiaceae, Gardenieae) are described and illustrated: *Randia wigginsii* Standley ex Gustafsson from montane tropical forests in Ecuador and northern Peru is mainly recognized by its tomentose to velutinous corolla tube and the lanate-velutinous pedicels and fruits. The possible features of being unarmed and having single male flowers are discussed. *Randia pubistyla* Gustafsson from lowland tropical dry forests in western Ecuador and Colombia is recognized by its puberulous style, the tomentose to puberulous fruits that usually are crowned by a calyx with reflexed lobes, and by the small thorns. *Randia longifolia* Gustafsson from lowland tropical humid forests in western Ecuador is mainly recognized by its relatively large, glabrous corolla, the linear calyx lobes, and by the reticulate finer vasculature on the abaxial surface of the leaves. The affinities for each species are discussed.

Randia is a neotropical genus of approximately 90 species ranging from ca. 30°N to 30°S. In South America and the Caribbean there are approximately 45 species. The genus is represented by shrubs, trees, and lianas in deciduous and evergreen vegetation from sea level to about 3300 m elevation. *Randia* can be recognized from other members of the Gardenieae by the following combination of characters: dioecious (female flowers with nonfunctional stamens, male flowers with a nonfunctional stigma and rudimentary ovary), pollen in permanent tetrads, a unilocular ovary with two parietal placentas, fruits with many discoid seeds embedded in a sweet pulp that turns dark when dry, thorns, and conspicuous short-shoots with clustered stipules and leaves. There are, however, exceptions. Monoecious and hermaphroditic species have been reported (Lorence & Dwyer, 1987; Burger & Taylor, 1993), pollen in dyads or monads have been reported (Burger & Taylor, 1993), some species are unarmed (Burger & Taylor, 1993; pers. obs.), and sometimes the short-shoots are less conspicuous (Burger & Taylor, 1993; pers. obs.). Within the genus there is also variation in the structure of the inflorescence. The inflorescences are usually terminal but sometimes axillary or cauliflorous (Burger & Taylor, 1993). Female flowers are usually solitary but sometimes in fascicles of 2 to 8 flowers (Burger & Taylor, 1993). The male flowers are usually in fascicles with a few to several flowers but sometimes form cymes with many flowers (Lorence & Nee, 1987; Lorence & Dwyer, 1987) and are sometimes solitary. This large variation makes it difficult to understand which genus has the closest affinities to *Randia*.

Robbrecht and Puff (1986) discussed that all genera in Gardenieae with pollen shed in permanent tetrads may represent a natural group. This gained support in a phylogenetic analysis by Persson (1996) but was contradicted by Andreasen and Bremer (1996, in press) and Persson (in press), who discussed that pollen in tetrads may have arisen several times in Gardenieae. In Persson's (1996) analysis *Casasia* gained support as sister to *Randia*, but the later mentioned analyses did not point out any strongly supported sister to *Randia*. Other neotropical genera that in these analyses (Andreasen & Bremer, 1996, in press; Persson, in press) grouped together with *Randia* and *Casasia* as possible relatives were *Rosenbergiodendron*, *Sphinctanthus*, and *Tocoyena*. *Sphinctanthus* and *Tocoyena* were not included in the analyses by Andreasen and Bremer (1996, in press). In this group the genus with the morphologically nearest affinities to *Randia* is *Casasia* by being dioecious and having pollen in tetrads. Lorence (1986) and Lorence and Dwyer (1987) discussed the morphological features in *Casasia* and *Randia* and also expressed doubt (Lorence & Dwyer, 1987) whether *Casasia* can be maintained as a valid genus. More phylogenetic studies in Gardenieae need to be done in order to find the monophyletic group to which *Randia* belongs.

The taxonomical work in *Randia* is complicated by the intraspecific variation in size and shape of leaves, calyx lobes, degree of pubescence, persistence of stipules and calyx, and number of thorns.

Extensive collecting in the Neotropics in the last 50 years has dramatically increased the number of herbarium specimens available, facilitating our understanding of the genus. Even so, several species are still unsatisfactorily collected with only a single or a few flowering specimens collected or none at all. During the course of a revisionary study of South American and Caribbean representatives of *Randia* (Gustafsson, in progress) collections representing a number of undescribed species have been encountered, three of which are described below.

Randia wigginsii Standley ex Gustafsson, sp. nov. TYPE: Ecuador. Loja: along Río Juntas, about 14–15 km S of San Lucas, ca. 2000 m, 10 Oct. 1944, *I. L. Wiggins 1099* (holotype, F; isotype, NY). Figure 1.

Species insignis habitu arbore 4–10(–16) m alta, floribus solitariis pedicellatis, pedicellis et ovariis et calycum tubis lanato-velutinis, corollarum tubis 3–4 mm diam. tomentoso-velutinis, corollarum lobis ciliatis, fructibus 4–5 × 3–4 cm longis, velutinis, a congeneris distincta.

Trees 4–10(–16) m high, dioecious. Leaf branchlets velutinous when young, glabrous when old, unarmed. Stipules fused at base, on long shoots not seen, persistent on brachyblasts, broadly to narrowly triangular, 5–12 × 3–6 mm, acute at apex, outer surface minutely verruculose, glabrate, inner surface with hairs and colleters at base, margin ciliate to glabrous. Petioles 5–17 × 1–2 mm, velutinous. Leaf blades subcoriaceous, broadly elliptic to obovate, 8–13(–17) × 4–7(–8) cm, shortly acuminate at apex, cuneate to shortly attenuate at base, adaxial midrib and secondary nerves slightly to distinctly impressed, tertiary veins slightly impressed to plane, veinlets plane, abaxial midrib and secondary nerves prominent, tertiary veins slightly elevated to level, veinlets level, adaxial leaf surface puberulous on midrib, otherwise glabrous, abaxial leaf surface tomentose to velutinous all over or mainly on midrib and secondary veins, margins glabrous. Flowers unisexual. Male flowers solitary, pedicels 10–30 × 1–1.5 mm, lanate-velutinous. Calyx tube 1–2 mm long, lanate-velutinous externally, with a ring of hairs at base internally, lobes 5, narrowly triangular to narrowly elliptic, 9–14 × 1–2 mm, acute at apex, pilose externally, glabrous or with a few scattered hairs internally, margins membranaceous, ciliate. Corolla white, salverform; tube 15–18 × 3–4 mm medially, tomentose to velutinous externally, pilose in upper half internally, glabrous below; lobes 5, broadly elliptic to suborbicular, ca. 12–14 × 11–12 mm, obtuse at apex, glabrous externally, pilose toward base internally, margins ciliate; anthers sessile, ca. 10 mm long, dorsifixed in lower third, attached distally in the widened part of the corolla tube, connective process minute or absent; style glabrous, nonfunctional stigma lobes ca. 4 mm long; ovary rudimentary. Female flowers not seen. Pedicels of fruit 10–25 × 1.5–3 mm, glabrate; fruits broadly ellipsoid to subspherical, 4–5 × 3–4 cm, surface with slightly elevated veins, densely velutinous when young, fruit wall ca. 1 mm thick, apex umbonate, persistent calyx lobes similar to those of male flowers in shape, size, and pubescence, seeds irregularly discoidal, 10–14 mm diam., imbedded in pulp.

Distribution and habitat. This new species is found in montane tropical forest from 1500 to 2250 m in Ecuador and northern Peru. The only two flowering collections examined (*Wiggins 10996, Espinosa 1919*) were collected in August and October.

Randia wigginsii is easily recognized by the solitary, pedicellate, male and female flowers; by the flowering pedicel, ovary, and calyx tube being lanate-velutinous; by the tomentose to velutinous corolla tube 3–4 mm in width; by the ciliate corolla lobes, and by the quite large velutinous fruit (4–5 × 3–4 cm). Useful vegetative characters are the petiolate, subcoriaceous leaves with glabrous adaxial sides (apart from the midrib) and slightly to distinctly impressed midrib and secondary veins. The abaxial sides are tomentose to velutinous (at least on vasculature) and have prominent midrib and secondary veins.

Randia wigginsii is here described as unarmed by assumption, as no thorns have been found on the studied material, and no mention of being armed is mentioned on the specimen labels. The only two male flowering specimens examined had solitary flowers, which is unusual in *Randia*. Further collecting will reveal if this is the true state for *R. wigginsii*. The closest relatives are probably found among a small group of undescribed montane species (Gustafsson, in prep.) with large fruits, pubescent leaves, and small pubescent flowers.

The name *Randia wigginsii* was written on the here designated holotype by Paul C. Standley but was never published by him.

Paratypes. ECUADOR. **Chimborazo:** canyon of Río Chanchán, ca. 5 km N of Huigra, 1500–2000 m, *Camp 3316* (MO, NY, S, US). **El Oro:** Guayquichuma, 03°49′S, 79°34′W, 1600 m, *Cornejo & Bonifaz 6022* (GB, GUAY); San Antonio, E of Zaruma, 2100–2200 m, *Espinosa E1919* (F, NY). **Loja:** 25 km Catamayo–Catocha, turnoff at Las Chinchas 2.3 km toward Piñas, 03°57′21″S, 79°29′07″W, 2250 m, *Jørgensen et al. 1464* (GB); Cerro de Celica, 2.7 km on Celica–Guachanamá road, 04°05′46″S, 79°56′45″W, 2250 m, *Jørgensen et al. 96* (GB). PERU. **Piura:** Huancabamba, Canchaque, Cerro Chorro Blanco,

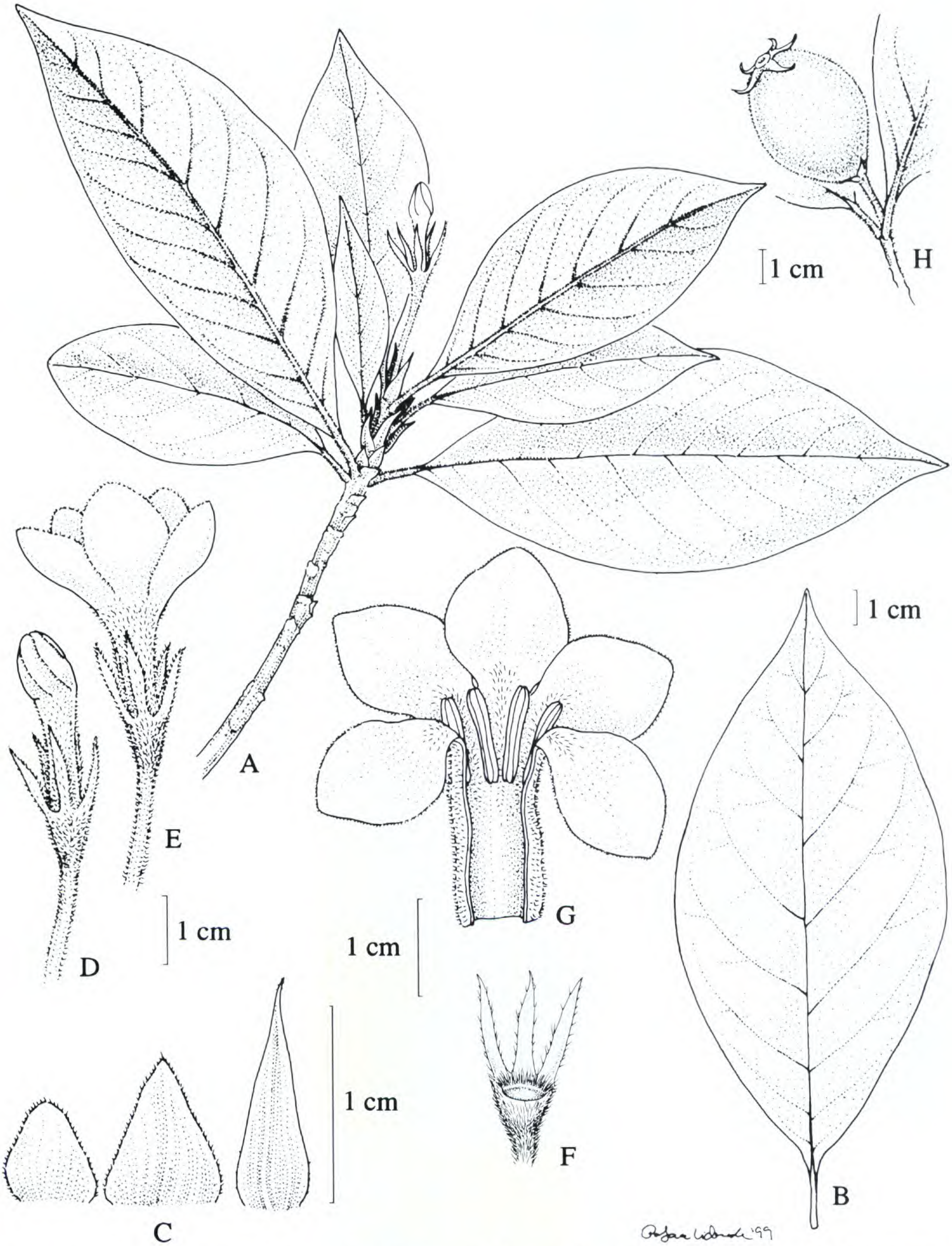

Figure 1. *Randia wigginsii* Standley ex Gustafsson. —A. Flowering branch, male specimen. —B. Adaxial side of leaf. —C. Stipules, small stipules (first and second from left) from short-shoot, large stipule from long-shoot. —D. Male flower bud. —E. Male flower in anthesis. —F. Calyx of male flower with two lobes removed. —G. Male corolla, opened. —H. Fruit. A, *Wiggins 10996* (F); B, *Diaz & Baldeón 2455* (GB); C–E, *Wiggins 10996* (F); F, *Espinosa 1919* (F); G, *Wiggins 10996* (F); H, *Diaz & Baldeón 2455* (GB).

1500–1900 m, *Diaz S. & Baldeón 2455* (GB), 1600 m, *Diaz S. et al. 2779* (GB).

Randia pubistyla Gustafsson, sp. nov. TYPE: Ecuador. Guayas: 15 km E of Guayaquil, Cerro Mirador de los Monos, 02°10′S, 79°58′W, 200 m, 26 Feb. 1992, *D. Rubio & W. Palacios 2439* (holotype, GB; isotypes, MO not seen, QCNE not seen). Figure 2.

Species *Randiae hebecarpae* Bentham affinis, sed stylis puberulis, fructibus majoribus ad 2.5 × 2 cm diam., spinis parvis ad 0.5 cm longas, foliis majoribus 7–16 × 4.5–10 cm differt.

Shrubs to small trees to 6 m high, deciduous, dioecious. Leaf branchlets tomentose when young, later glabrate, thorns 1 or 2 at base of brachyblast, the thorns short, only to 5 mm, straight to slightly deflexed. Stipules fused at base, persistent on long shoots, narrowly to broadly triangular, 4–6 × 2–3 mm, aristate to mucronate at apex, outer surface tomentose, inner surface with hairs and colleters at base, stipules on brachyblasts persistent, broadly triangular to suboblong, 3–8 × 2–4 mm, obtuse to mucronate at apex, outer surface minutely verruculose, with many parallel veins, glabrous, inner surface with hairs and colleters at base, margin minutely ciliate. Petioles 2–8 × 0.5–1 mm, tomentose to puberulous. Leaf blades papery, broadly elliptic, 7–16 × 4.5–10 cm, shortly acuminate to acuminate, sometimes apiculate at apex, attenuate at base, all veins on adaxial side ± plane, abaxial midrib and secondary veins prominent, tertiary veins less prominent to plane, veinlets plane, reticulate, adaxial leaf surface glabrous or with scattered hairs on midrib, abaxial leaf surface tomentose to puberulous when young, glabrescent, the hairs on midrib and secondary veins more persistent, blade margins ± ciliate. Flowers unisexual. Male inflorescence in fascicles of 2 to 8 flowers, pedicels 4–8 × 0.3–0.5 mm, tomentose. Calyx tube to 0.5 mm long, pilose externally, glabrous internally, lobes 5, irregularly linear-oblong, 3–7 × 0.3–1.5 mm, acute to shortly acuminate at apex, glabrous or pilose toward base externally, glabrous internally, margin fimbriate to ciliate. Corolla white, salverform, tube 9–13 × ca. 1.0 mm medially, distally widened, pilose externally, pilose internally but glabrous toward base, lobes 5, oblong to broadly obovate, 5–9 × 4–7 mm, obtuse to rounded at apex, ± pilose externally, glabrous internally but basally pilose, margin glabrous; anthers sessile, 2–3 mm long, dorsifixed in lower third, attached distally in the widened part of the corolla tube, connective process absent; style puberulous, nonfunctional stigma lobes ca. 1 mm long; ovary rudimentary. Female flowers not seen. Pedicels of fruit 5–8 × 1.0–2.0 mm, glabrate; fruits subspherical to ellipsoid, ca. 2–3 × 1.8–2.5 cm, tomentose when young, later becoming puberulous, yellow when mature, fruit wall ca. 0.5 mm thick, calyx reflexed and persistent; seeds irregularly discoidal, 5.0–9.0 mm diam, imbedded in pulp.

Distribution and habitat. *Randia pubistyla* is found in lowland tropical dry forests in western Colombia and western Ecuador. The only three flowering collections examined (*Brand 1082*, *Haught 4792*, *Rubio & Palacios 2439*) were collected in February (Ecuador) and April (Colombia).

Randia pubistyla is characterized by the puberulous style and the tomentose to puberulous fruit, which is often characteristically crowned by the almost free, reflexed calyx lobes. The small (only to 0.5 cm long) thorns on the branchlets, together with the usually reticulate venation of the broadly elliptic leaf blades, are useful vegetative characters. It is similar to *Randia hebecarpa* Bentham, a species found in northeastern South America, in size and pubescence of the flowers and leaf shape, but that species has a smooth style, distinctly smaller fruit (to 1.5 cm diam.), larger thorns (0.5–1.6 cm long), and smaller leaves (3.0–6.5 × 1.2–2.7 cm).

Paratypes. COLOMBIA. **Antioquia:** La Playona, 15 km from Turbo, 10 Mar. 1958, *Bernal 10* (COL 2 sheets); Mun. de Arboletes, 5 km S of Arboletes on rd. to Turbo, 08°49′N, 76°27′W, 0–50 m, *Zarucchi et al. 4940* (F, K, MO, NY); Turbo, hills near Río Mulatas, 300 m, *Haught 4792* (COL, US); rd. Tapón del Darién, sector Río León–Lomas Aisladas, km 37, 0–50 m, *Brand 1212* (COL, MO), *Brand 1082* (COL, MO); Corrto. Currulao, new Antioquia rd. E-NE of Turbo, 11 km from Currulao, 0–50 m, *Callejas et al. 4966* (MO 2 sheets, NY). **Chocó:** Mun. de Ríosucio, vicinity of El Salto de Tilupo, corrto. Tilupo, *Romero-Castañeda 6246* (COL); Parque Natural Nacional, Los Kátyos, Río Peye rd. to Tilupo, 0–100 m, *León 470* (COL); Los Kátyos, Tilupo, 250–350 m, *León 492* (COL); ascent to El Alto de Limón, 250–300 m, *León 430* (COL, MO); Peye, rd. to El Alto del Limón, 50–200 m, *León & Forero P. 1795* (COL, MO). ECUADOR. **Esmeraldas:** ca. 7 km SW of Súa, 00°51′N, 78°58′W, 50 m, *Webster 22822* (MO); Cerro Mutiles, 00°54′S, 79°37′W, 200–300 m, *Cornejo & Bonifaz 5262* (GB, GUAY). **Manabí:** 5 km from Jama on rd. to Pedernales, 00°10′N, 80°14′W, 50 m, *Cornejo & Bonifaz* 5836 (GUAY). **Guayas:** Bosque protector Paraíso, 02°12′S, 79°57′W, 200 m, *Cornejo & Bonifaz 1364* (GB, GUAY), 150 m, *5598* (GB, GUAY); Cerro Azul, W of Guayaquil, *Asplund 15402* (S); Cerro Azul, 200 m, *Harling 4839* (S); Cerro Azul, 02°08′S, 79°59′W, 400–500 m, *Cornejo & Bonifaz 2926* (GB, GUAY); Cerro Azul, 10 km NW of Guayaquil on rd. to Salinas, 50–100 m, *Dodson & Thien 527* (MO); Cerro Azul, Cordillera Chongón-Colonche, behind Cemento Nacional, 12 km W of Guayaquil, Canyon of Canoa, 02°15′S, 80°00′W, *Gentry & Josse 72348* (GB); Chongón, Hacienda Cerro Azul, 300–500 m, *Harling et al. 9509* (GB); Cantón Guayaquil, Bosque Protector Cerro Blanco, 15 km on rd. to Salinas, 02°10′S, 79°58′W, 350

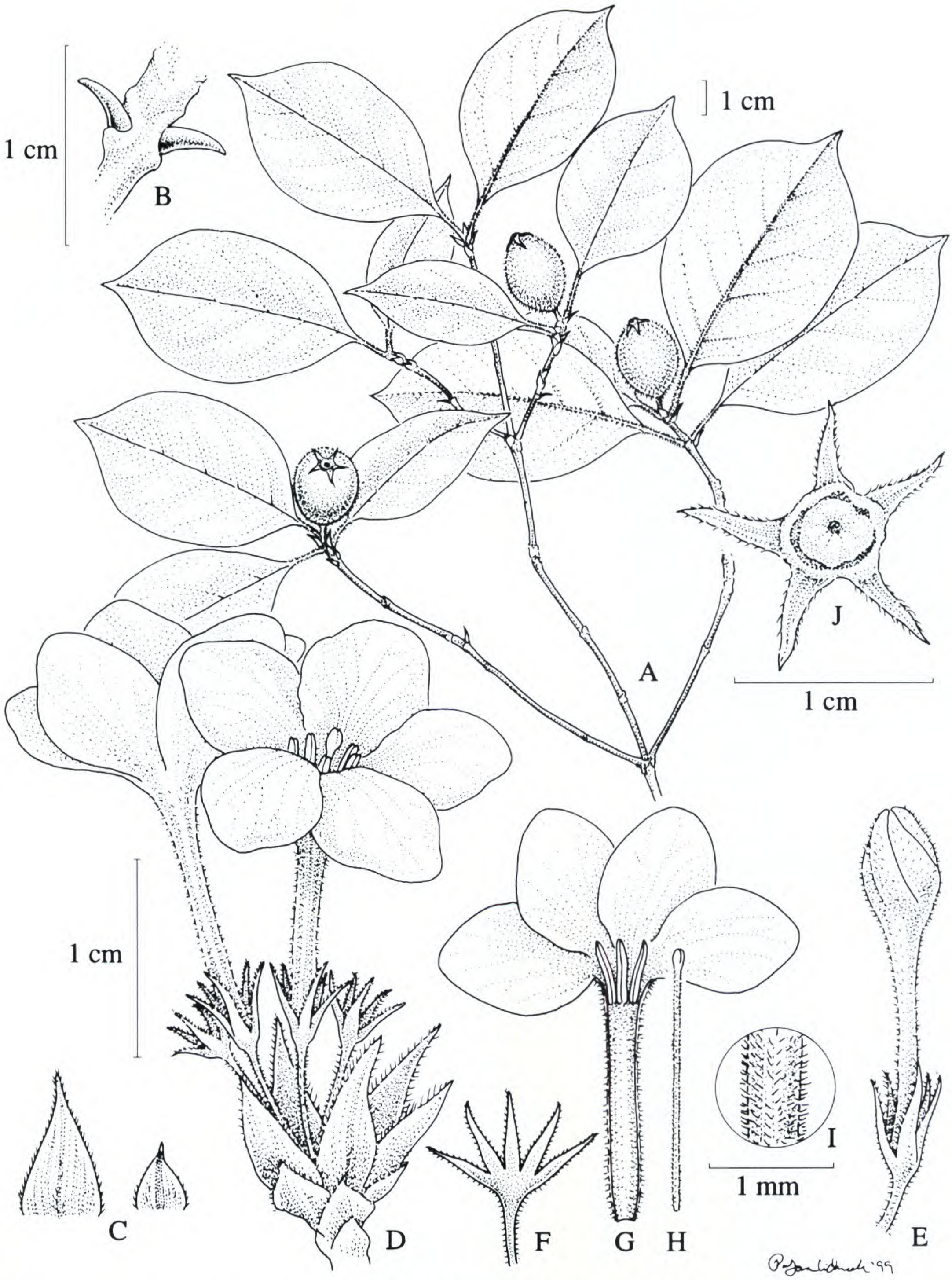

Figure 2. *Randia pubistyla* Gustafsson. —A. Fruiting branch, female specimen. —B. Thorns. —C. Stipules from short-shoot. —D. Short-shoot with male inflorescence. —E. Male flower bud. —F. Calyx of male flower, opened. —G. Male corolla, opened. —H. Style. —I. Detail of style. —J. Detail of persistent calyx on fruit. A–B, *Harling 4822* (S); C–D, *Rubio & Palacios 2439* (GB); E–I, *Haught 4792* (COL); J, *Cornejo & Bonifaz 5598* (GB).

m, *Rubio et al. 1770* (GB, GUAY), *1810* (GB, GUAY), 300 m, *Rubio et al. 1993* (MO, GUAY), 02°10′S, 79°50′W, 100 m, *Tipaz et al. 839* (GB, GUAY); 13 km on rd. to Salinas, 02°10′S, 79°58′W, 350 m, *Rubio & Tipaz 2383* (GB); along Sendero Buenavista above visitor center, 02°10′S, 79°58′W, 250 m, *Neill & Núñez 10512* (GB), 02°10′S, 80°10′W, 300–400 m, *Neill & Núñez 10662* (GUAY); Reserva Ecología Churute, Cerro Cimalón, 02°25′S, 79°38′W, 50–100 m, *Cornejo & Bonifaz 5126* (GB, GUAY); Río Daule below Pichincha, Hacienda Santa Barbarita, *Harling 4822* (S).

Randia longifolia Gustafsson, sp. nov. TYPE: Ecuador. Los Ríos: Hacienda Clementina, 200 m, 27 Jan. 1947, *G. Harling 186* (holotype, S). Figure 3.

Species *Randiae carlosianae* K. Krause affinis, sed corollis majoribus, corollarum tubis 30–40 mm longis, corollarum lobis 20–25 mm longis, calycis lobis anguste triangularibus ad linearibus 1.0–2.0 mm latis, venis parallelis numeris differt.

Shrubs to small trees to 6 m high, dioecious. Leaf branchlets puberulent when young, hairs ± erect, unarmed. Stipules fused at base, persistent on long shoots, narrowly triangular, 12–15 × 2–4 mm, acuminate to acute at apex, with many parallel veins, glabrous externally, with hairs and colleters at base internally, margin ciliate, stipules persistent on brachyblasts, broadly triangular to narrowly triangular, ca. 2–10 × 2–4 mm, acute to mucronate at apex, with many parallel veins, verruculose, glabrous externally, with hairs and colleters at base internally, margin ciliate. Petioles 3–6 × 0.8–1.2 mm, puberulent. Leaf blades papery, obovate, (11-)13–21 × 4–8(–9) cm, shortly acuminate at apex, shortly attenuate at base, adaxial midrib impressed at base, otherwise all veins ± plane, abaxial midrib and secondary veins prominent, smaller veins less prominent, reticulation evident, adaxial leaf surface glabrous, minutely tuberculate, abaxial leaf surface puberulous on midrib, secondary and tertiary veins, margin ± ciliate. Flowers unisexual. Male inflorescence in fascicles of 2 to 6 flowers, pedicels 5–10 × ca. 1 mm, puberulent. Calyx tube to 0.5 mm long, glabrate externally, glabrate with a few basal hairs internally, lobes 5, narrowly triangular to linear, 10–15 × 1–2 mm, acute at apex, with parallel venation, glabrous to puberulent throughout, margins ± ciliate; corolla white, salverform, tube 30–40 × 2.0–4.0 mm medially, distal part widened, glabrous externally, puberulent in upper part, glabrous below internally, lobes 5, ovate to broadly elliptic, ca. 20–25 × 10 mm, subacute at apex, glabrous or with a few small hairs externally, glabrous or with a few basal hairs internally, margin glabrous; anthers sessile, ca. 6.0 mm long, dorsifixed in lower third, attached distally in the widened part of the corolla tube, connective process absent; style glabrous, nonfunctional stigma lobes ca. 5.0 mm long; ovary rudimentary. Female flowers not seen. Pedicels of fruit 2.0–10 mm × ca. 2.0 mm. Fruits ellipsoid, 3–4 × 2.5–3 cm, puberulous when young, glabrescent, yellow when mature, fruit wall ca. 1 mm thick, persistent calyx erect; seeds irregularly discoidal, 7–10 mm diam., imbedded in pulp.

Distribution and ecology. This species is known only from the rapidly diminishing lowland tropical humid forests in western Ecuador. The two sole flowering specimens examined (*Harling 186*, *Cornejo & Bonifaz 880*, unicates) were collected in late November and January.

Randia longifolia is recognized by the relatively large, glabrous corolla and by the long, almost free, characteristically linear calyx lobes with parallel venation. The fruits are usually crowned by a persistent erect calyx. On the abaxial surface of the leaves, finer vasculature makes the reticulation evident.

Randia longifolia might be confused with *R. carlosiana* K. Krause, another species occurring in the same area, by the similar fruits and large leaves, but that species differs by being armed, by having smaller corollas with tubes 20–26 mm long and lobes 10–14 mm long, and by usually having foliaceous, obovate calyx lobes (broader than 2 mm) with usually reticulate venation.

Randia longifolia is here described as unarmed by assumption, as no thorns have been found on the studied material and no mention of being armed is mentioned on the specimen labels.

Paratypes. ECUADOR. **Esmeraldas:** Cerro Mutiles, 00°54′N, 79°37′W, 250 m, *Cornejo & Bonifaz 5185* (GB, GUAY). **Manabí:** Vuelta larga, 00°45′S, 80°50′W, 200 m, *Bonifaz 837* (GB, GUAY); rd. Portoviejo–Pichincha, 3 km E of San Plácido, 150–200 m, *Harling & Andersson 24888* (GB). **Los Ríos:** Hacienda Clementina, 200 m, *Fagerlind & Wibom* 2650 (S); Hacienda Clementina, Cerro Samama, above Río Mombe, ca. 38 km NE of Babahoyo, 01°39′S, 79°22′W, 200–400 m, *Ståhl & Knudsen 1182* (GB); Jauneche, 70 km on rd. Quevedo–Palenque via Mocachi, Cantón Vinces, 100 m, *Dodson et al. 7993* (MO), *Dodson & Gentry 9883* (MO, US); Jauneche, rd. Mocachi–Palenque, 15 km E on rd. Empalme–Balzar, 50–100 m, *Dodson et al. 14461* (MO, NY); near Pichilingue, 50–100 m, *Játiva & Epling 307* (NY, S). **Guayas:** Río Ayampe, Cerro El Burro, 01°41′S, 80°40′W, *Cornejo & Bonifaz* 880 (GUAY); Bosque Protector Cerro Blanco, 02°10′S, 79°58′W, 400 m, *Cornejo & Bonifaz 1783* (GB, GUAY). **El Oro:** between Piedras and Moromoro, 300 m, *Escobar 746* (MO).

Acknowledgments. I am grateful to the curators of the following herbaria for making their collections available for study: COL, F, GB, GUAY, K,

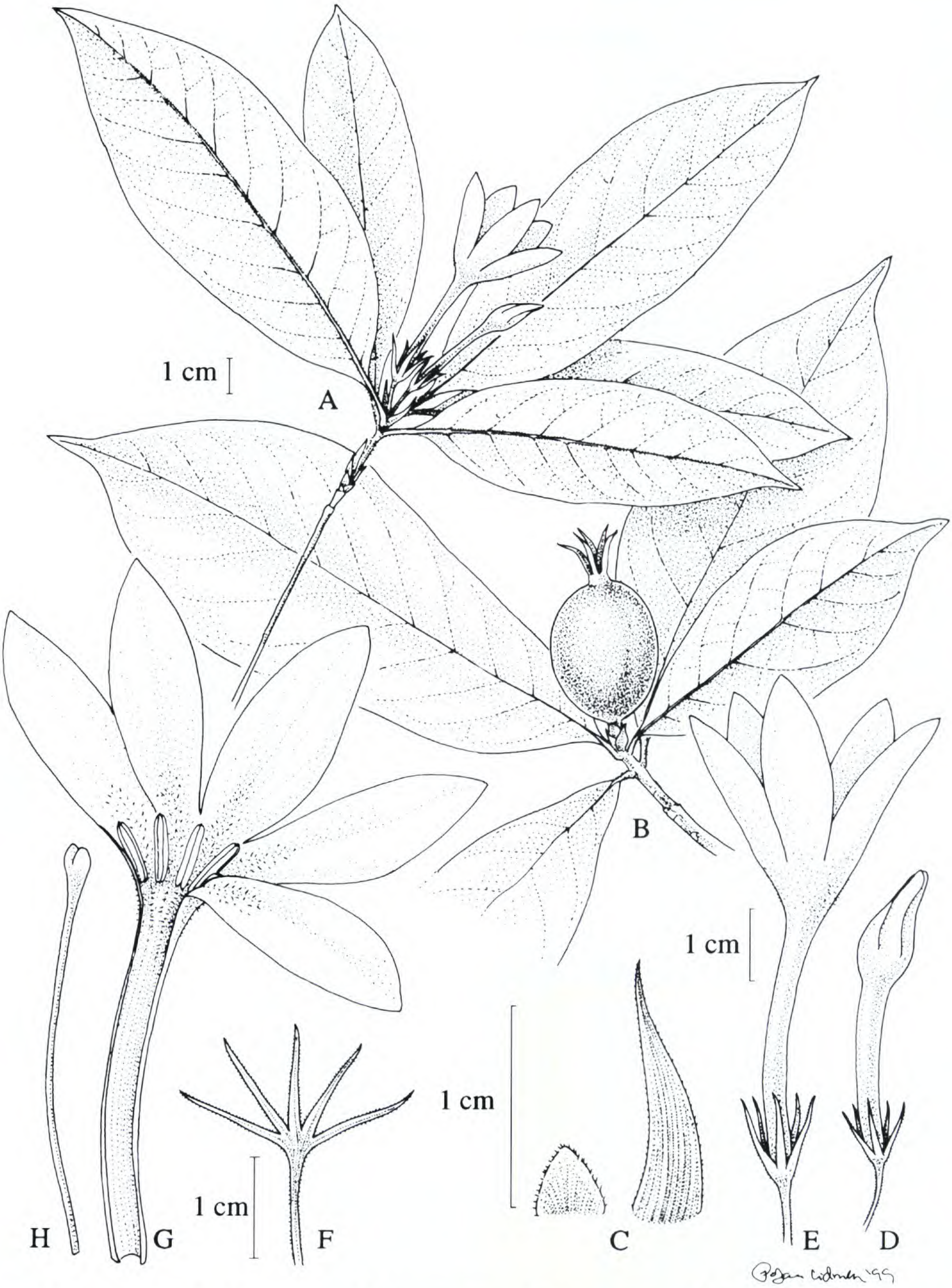

Figure 3. *Randia longifolia* Gustafsson. —A. Flowering branch, male specimen. —B. Fruiting branch, female specimen. —C. Stipules, small stipule (left) from base of short-shoot, large stipule (right) from long-shoot. —D. Male flower bud. —E. Male flower. —F. Calyx of male flower, opened. —G. Male corolla, opened. —H. Style. A, *Harling 186* (S); B, *Bonifaz 837* (GB); C–H, *Harling 186* (S).

MO, NY, S, US. Special thanks are due to the curators of GUAY, MO, and QCNE who sent several collections as gifts. I thank Pollyanna Lidmark for preparing the excellent illustrations and Lennart Andersson for providing useful comments on the manuscript.

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New Taxa and Combinations in *Eleutherococcus* (Araliaceae) from Eastern Asia

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ABSTRACT. While preparing a monographic study of *Eleutherococcus*, we discovered the three new taxa, *E. brachypus* var. *omeiensis*, *E. huangshanensis*, and *E. pseudosetulosus*, described here. In addition, three new combinations, *E. divaricatus* var. *chiisanensis*, *E. pilosulus*, and *E. pubescens*, are proposed.

Eleutherococcus Maximowicz (1859, emend. C. H. Kim & B.-Y. Sun) is an endemic Asian genus with about 35 species distributed mainly in northeastern Asia including China, Korea, and Japan, with some members also extending to southwestern Asia (Kim, 1997). The genus *Acanthopanax* (Decaisne & Planchon) Witte was initially recognized as a subgenus of *Panax* L. by Decaisne and Planchon (1854) and raised to generic rank by Witte (1861). Harms (1894) combined the two genera, and adopted the name *Acanthopanax*, which has since been widely used by many botanists. However, *Acanthopanax* does not have priority and is therefore illegitimate under current ICBN nomenclature (Greuter et al., 1994). Some recent authors (e.g., Hu, 1980; Ohashi, 1987; Hsu & Pan, 1993) have therefore transferred taxa from *Acanthopanax* to *Eleutherococcus*.

Plants of *Eleutherococcus* are shrubs and are characterized by the presence of prickles, five-merous flowers with two to five carpels, and palmately compound leaves. The genus as a whole is highly variable resulting in much taxonomic confusion (Kim, 1997). For example, *E. koreanus* Nakai was distinguished from *E. senticosus* (Ruprecht & Maximowicz) Maximowicz based on its unarmed twigs. However, examination of specimens from various regions has shown this character to be merely included within the limits of natural variation among individuals. While preparing a monographic study of *Eleutherococcus*, we found three new taxa and describe them here: *E. brachypus* var. *omeiensis*, *E. huangshanensis*, and *E. pseudosetulosus*; three new combinations are also made: *E. divaricatus* var. *chiisanensis*, *E. pilosulus*, and *E. pubescens*.

Eleutherococcus brachypus (Harms) Nakai var. **omeiensis** C. H. Kim & B.-Y. Sun, var. nov. TYPE: China. Sichuan: Omei Hsien, Mt. Omei, 10 Oct. 1940, *T. C. Lee 3794* (holotype, US; isotype, A).

Foliola 3, terminalia foliola elliptica, glabra; terminales petioluli ca. 1 cm longi, glabri. Flores cum pedicellis articulatis.

A hermaphroditic shrub to 2 m tall; stems erect, glabrous. Leaves 3-foliolate, leaflets elliptic, somewhat chartaceous, glabrous on both surfaces, secondary veins 3 to 5 pairs, the apex obtuse or acuminate, the margin entire, the base cuneate; petiole 0.5 cm long, glabrous; terminal leaflets 2–4 × 1–1.5 cm, petiolule relatively long, ca. 1 cm; lateral leaflets somewhat smaller than terminal ones, sessile or short-petiolulate. Inflorescence of umbels arranged in a simple cyme at the end of long branches of the current year's growth, rarely at the end of short branches, glabrous; pedicel articulated at uppermost part, 1–1.5 cm long, glabrous. Calyx 5-toothed; petals 5; stamens 5; carpels 5, style united into a single column, stigma indistinctly 5-lobed, ca. 1 mm long; ovary 2 mm long. Fruit unknown.

This variety is thus far known only from Mt. Omei, Sichuan, China, from which the epithet was derived. The typic variety occurs in Gansu, Shanxi, and Shaanxi in China. *Eleutherococcus brachypus* var. *omeiensis* differs from other members of the genus by its articulation in the uppermost part of the pedicel. This variety is also distinguished from the typic variety in having a long (ca. 1 cm) petiolule on the terminal leaflet. Other features are the same and hence we recognize it as a variety of *E. brachypus*.

Eleutherococcus divaricatus (Siebold & Zuccarini) S. Y. Hu var. **chiisanensis** (Nakai) C. H. Kim & B.-Y. Sun, comb. et stat. nov. Basionym: *Acanthopanax chiisanensis* Nakai, J. Arnold Arbor. 5: 5. 1924. TYPE: Korea. Chejudo: in silvis Yongsil 1000 m, *E. Taquet 890* (lectotype, selected here, C; isolectotypes, A, E).

Eleutherococcus divaricatus var. *chiisanensis* differs from the typic variety in having setose trichomes on its abaxial leaf surface rather than exclusively sericeous indumentum. In variety *chiisanensis*, these setose trichomes are often mixed with sericeous ones in varying degrees. Other morphological features are the same, and hence we recognize this taxon as a variety of *E. divaricatus*. It is endemic to the Korean peninsula, whereas the typic variety occurs in Hokkaido, Honshu, Shikoku, and Kyushu in Japan and Shanxi, Henan, and Zhejiang in eastern China. Among the syntypes (*E. Taquet 890*, *E. Taquet 889*, *E. Taquet 5660*, and *T. Nakai 369*), the first, here selected as the lectotype, has relatively well-preserved leaf indumentum and distinct pedicels in umbels, which are diagnostic characters.

Representative specimens. KOREA. **Cheju-do:** in silvis Yongsil 1000 m, 17 Aug. 1918, *E. Taquet 889* (A, C, E, TI); in silvis Yongsil 1000 m, *E. Taquet 5660* (E); Yongshil 1100 m hill, 18 Sep. 1995, *B. Y. Sun s.n.* (JNU [5 sheets]). **Chollabuk-do:** Mt. Unjang, 6 Aug. 1994, *C. H. Kim 5044* (JNU [8 sheets]). **Chollanam-do:** Mt. Chiri, 1 July 1913, *T. Nakai 369* (TI); Chirisan (Mt. Chiri), Aug. 1934, *R. K. Smith s.n.* (US); Mt. Chiri, Nogodan, 11 Aug. 1988, *C. H. Kim 5011* (JNU [8 sheets]). **Hamgyungbuk-do:** Myungchon-gun, Sanggo-myon, Chilbosan, 19 Aug. 1924, *? 114* (TI). **Hamgyungnam-do:** Sam-su District, Onkol-muri valley, 8 Aug. 1887, *V. Komarov 1148* (BM); Hogen, yutenji, Hongo-san, 7 July 1918, *E. H. Wilson 10494* (A). **Kangwon-do:** Mt. Odae, 17 Aug. 1988, *C. H. Kim 5042* (JNU [2 sheets]); Inje-gun, Daeamsan, 28 Sep. 1969, *Y. M. Kang 44755* (SNU); Daekwalyung, Neugchongsan, 22 Aug. 1969, *T. B. Lee & M. Y. Cho s.n.* (SNUA). **Kyungsangbuk-do:** without precise locality, 13 Sep. 1938, *T. H. Chung 9556* (SNU).

Eleutherococcus huangshanensis C. H. Kim & B.-Y. Sun, sp. nov. TYPE: China. Anhui: Mt. Wangshan, 19 Oct. 1933, *W. C. Cheng 4146* (holotype, SING; isotypes, BM, US). Figure 1.

Frutex erectus; ramulis glabris; internodio sparsis triangulis non-elasticis aculeis, ca. 0.5 cm longis, ca. 0.2 cm latis; foliola 5, supra et subtus glabra, duplicato-serrata. Umbellae (inflorescentiae) glabres.

A hermaphroditic shrub to 5 m tall; stems erect, glabrous with scattered prickles, sometimes a single prickle at a node or below the petiole. Prickles non-elastic and stout, 0.5 cm long, 0.2 cm wide, sharp-pointed with a broadened and enlarged base, pointing downward; the base narrowly elliptic, 1 cm long. Leaves 5-foliolate, blade widely elliptic or ovate, ca. 10 × 5 cm, chartaceous, glabrous on both surfaces, lateral veins 7 to 9 pairs, the apex acute to acuminate, the margin doubly serrate, the base cuneate; petiolule of terminal leaflet 0.5 cm long, glabrous; petiole ca. 8 cm long, glabrous. Inflorescence of umbels arranged in a simple cyme at the end of long branches of the current year's growth, glabrous; pedicel 1 cm long, glabrous. Calyx dentate or obscure; petals 5; stamens 5, the filament 2.5 mm long; carpels 5 or 3 to 4, styles united into a single column, stigma indistinctly 5-lobed, sometimes 3- to 4-lobed, 1.5 mm long; ovary 2 mm long. Fruits globose, 5-angular when young, 8 mm long; the disc ca. 3 mm wide. Flowering August, fruiting October.

This species is restricted to Mt. Hwangshan, Anhui, China, at around 2000 m elevation and is named for the type locality. *Eleutherococcus huangshanensis* is most similar to *E. henryi* Oliver, *E. leucorrhizus* Oliver, and *E. setchuenensis* (Harms) Nakai. However, it differs from *E. henryi* by the glabrous nature of its inflorescence, twig, and abaxial leaf surfaces, and from *E. setchuenensis* by its chartaceous leaves with 5 leaflets and double serrate margins. This species is also distinguished from *E. leucorrhizus* by the shape, position, and number of prickles on its twigs. Characteristics of the prickles and also constancy in the number, shape, and pubescence of plant parts are usually important diagnostic features for evaluating species limits throughout the genus, and thus *E. huangshanensis* is sufficiently well distinguished from its allied species to be recognized as distinct. The three related species are distributed widely in China. However, *E. leucorrhizus* occurs in central and western China including Sichuan, Yunnan, Hubei, Gansu, and Shaanxi, and extending to Bhutan; *E. setchuenensis* is mainly found in central China; and *E. henryi* is distributed in central middle and eastern China centering on Hubei.

Paratypes. CHINA. **Anhui:** Wang Shan, 1800 m, 28 Aug. 1923, *N. K. Ip s.n.* (UC); Hwang Shan, 1900 m, 11 Aug. 1924, *K. Ling 1172* (UC); Wang Shan, 23 Sep. 1965, *? 779* (PE); Wang Shan, 1800 m, 14 Aug. 1973, *Zhou 474* (PE); Shexian, 18 Sep. 1987, *C. L. Huang 0253* (AAUF).

Eleutherococcus pilosulus (Rehder) C. H. Kim & B.-Y. Sun, stat. nov. Basionym: *Acanthopanax giraldii* Harms var. *pilosulus* Rehder, J. Arnold Arbor. 9: 99. 1928. *Eleutherococcus giraldii* (Harms) Nakai var. *pilosulus* (Rehder) S. Y. Hu, J. Arnold Arbor. 61: 109. 1980. *Acanthopanax wilsonii* Harms var. *pilosulus* (Rehder) X. P. Fang & C. K. Hsieh, Bull. Bot. Res., Harbin. 7: 90. 1987. *Eleutherococcus wilsonii* (Harms) Nakai var. *pilosulus* (Rehder) P. S. Hsu & S. L. Pan, Sida 15: 594. 1993. TYPE: China. Kansu: Upper Tebbu country, in willow scrub, with birches, along streams, 3350 m, July–Aug. 1925, *J. F. Rock 13106* (holotype, A; isotype, UC).

Figure 1. *Eleutherococcus huangshanensis* C. H. Kim & B.-Y. Sun. —a. Habit, flowering branch. —b. Flower with two petals and three stamens removed. —c. Fruit. (a, b from *Zhou 474*; c from *W. C. Cheng 4146*.)

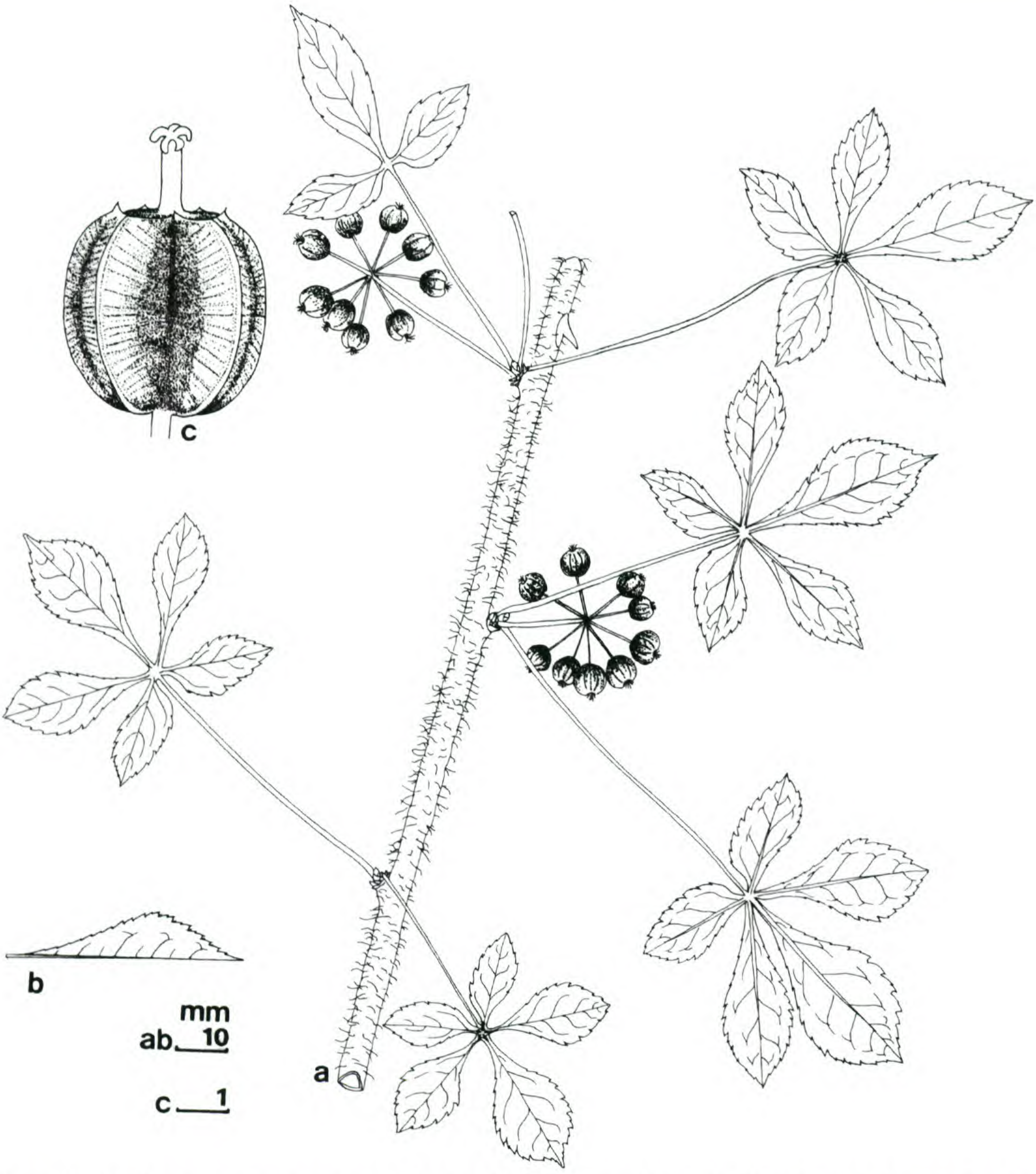

Figure 2. *Eleutherococcus pseudosetulosus* C. H. Kim & B.-Y. Sun. —a. Habit. —b. Abaxial surface of terminal leaflet. —c. Young fruit. (From *D. E. Boufford & B. Bartholomew 24546.*)

This species has previously been recognized as a variety of either *E. giraldii* or *E. wilsonii.* Comparison of these three taxa, however, shows that *E. pilosulus* has narrower leaflets, a densely pubescent abaxial leaf surface, and twigs with elastic prickles with an elliptically protuberant base. *Eleutherococcus giraldii* has glabrous leaflets and twigs with elastic prickles with an indistinct base, and *E. wilsonii* has glabrous leaflets and almost unarmed twigs. *Eleutherococcus pilosulus* is limited to northern China, including Gansu and Qinghai, whereas *E. wilsonii* is distributed widely in China except the eastern part, and *E. giraldii* mainly occurs in Gansu, Hubei, and Shanxi, Shaanxi of upper middle China. On the basis of these characters, we therefore prefer to recognize *E. pilosulus* as a distinct species.

Representative specimens. CHINA. **Gansu (Kansu):** Hsia Mo K'ou, near Lichen, 2000–2300 m, 7 July 1923, *R. C. Ching 337* (A, US); Taochow, SW of Tow river, *Wm.*

Purdom s.n. (A); Tao river basin, W of Adjuan, eastern Minshan range, 3050 m, 5 July 1925, *J. F. Rock 12657* (A, C); Tianzhu, 2500 m, 14 July 1959, *He 4834* (PE). **Qinghai:** Menyuan, 2500 m, 19 June 1960, *Qinghai-Gansu Exped. 2687* (PE).

Eleutherococcus pseudosetulosus C. H. Kim & B.-Y. Sun, sp. nov. TYPE: China. Sichuan: Dujianyan, Qishuping to Mashanping, upstream from the town of Longxi on the Longxi River, in thicket on open slope near *Cryptomeria* plantation, 1750 m, 4 Sep. 1988, *D. E. Boufford & B. Bartholomew 24546* (holotype, BM; isotype, NY). Figure 2.

Frutex scandens; ramus internodio aliquantum setis densis, ca. 0.25 cm longis, aliquantum triangulis aculeis raris, ca. 0.4 cm longis, ca. 0.15 cm latis, nodi vel petioli basis absque aculeo. Pedunculi 17–42 mm, glabri; pedicelli 8–10 mm, glabri.

A dioecious shrub to 2 m tall; stems scandent, ± densely hirsute, trichomes slender and somewhat flexuous, 0.25 cm long, a few scattered prickles, prickles absent at node or below the petiole. Prickles pointing downward, broadened at base, 0.4 cm long, 0.15 cm wide. Leaves 5-foliolate; terminal leaflet obovate, 3.8–4.4 × 1.7–2 cm, slightly setose on adaxial surface, glabrous on abaxial surface, lateral veins 5 to 6 pairs, the apex acuminate, the margin doubly serrate, the base cuneate; petiolule of terminal leaflet 0–3 mm long; petiole 5.2–6.2 cm long, glabrous. Inflorescence a solitary umbel at the end of short branches of current year's growth; peduncle 1.7–4.2 cm long, glabrous; pedicel 0.8–1 cm long, glabrous. Calyx minutely 5-dentate; carpels 5, styles 5, connate to above middle, free arms recurved. Fruits widely globose, 6–7 mm long, black, 5-angular when young; the disc 1 mm wide. Fruiting September.

This species is restricted to Sichuan Province, China. The name is derived from the nature of the surface of its twigs, which resembles that of *E. setulosus* (Franchet) S. Y. Hu. *Eleutherococcus setulosus* and the new species described here are readily distinguishable from other members of the genus by their bristle-like elastic prickles at the internodes along the twigs. However, *E. pseudosetulosus* differs from *E. setulosus* by its glabrous peduncle and pedicel, longer and sparser bristle-like prickles in the internodes, and the absence of nonelastic recurved prickles at the nodes. *Eleutherococcus setulosus* also occurs in Sichuan Province.

Eleutherococcus pubescens (Pampanini) C. H. Kim & B.-Y. Sun, stat. nov. Basionym: *Acanthopanax spinosus* (L.f.) Miquel var. *pubescens* Pampanini, Nuovo Giorn. Bot. Ital. 2: 678. 1910. *Acanthopanax gracilistylus* W. W. Smith var. *pubescens* (Pampanini) H. L. Li, Sargentia 2: 85. 1942. *Eleutherococcus gracilistylus* (W. W. Smith) S. Y. Hu var. *pubescens* (Pampanini) S. Y. Hu, J. Arnold Arbor. 61: 109. 1980. TYPE: China. Hupeh: Monti di Ru-teen, ca. 700 m, Sep. 1906, *C. Silvestri 1600* (lectotype, selected here, FI, A [photo]).

This species is similar to *E. gracilistylus* and *E. spinosus*, but differs from them in having sericeous hairs throughout the abaxial leaf surface rather than being glabrous, except with tufted hairs in the axil of the veins and setose trichomes along the midvein. These characteristics are constant throughout the species. *Eleutherococcus spinosus* is confined to the Japanese archipelago, whereas *E. gracilistylus* is distributed throughout China and on Cheju Island in Korea. Based on these differences, we prefer to recognize *E. pubescens* as a distinct species.

Representative specimens. CHINA. **Hubei (Hupeh):** Fan-sien, ca. 800 m, 20 May–3 June 1906, *C. Cilvestris 1598* (A[photo]); Wuchang, 23 Apr. 1933, *S. C. Sun 1055, 1075* (A); Tung Chien Hsien, road side, 10 Aug. 1928, *H. G. Cheo 183* (NY); Enshi, 1400 m, 22 June 1958, *? 24397* (NAS, PE); Yichang, 700–800 m, 7 May 1963, *Z. D. Jiang 61* (PE). **Henan (Honan):** without precise locality, *? 20181* (PE). **Jiangsu (Kiangsu):** Nanking, 19 May 1921, *L. F. Tsu 591* (UC). **Shanxi (Shansi):** Yuan Kiu Hsien, Ni Shan, 28 Sep. 1921, *Y. Hers H-1824* (A). **Sichuan (Szechuan):** Le-po Hsien, 2800 m, 14 July 1934, *T. T. Yu 3391* (PE).

Acknowledgments. This work was supported by the Korea Science and Engineering Foundation (grant no. KOSEF 951-0506-040-2) to B.-Y. Sun. The authors thank Pete Lowry and two anonymous reviewers for their helpful comments on this manuscript and the directors of the following herbaria for the loan of specimens: A, AAUF, ANSP, B, BM, C, E, FI, IBK, K, KUN, KYO, L, LINN, MAK, MHA, MO, NAS, NY, P, PE, PNH, S, SING, SNU, SNUA, TI, U, UC.

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Two New Species of *Secamone* (Apocynaceae, Secamoneae) from Madagascar

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ABSTRACT. *Secamone schatzii* and *S. linearis* are two new species of Apocynaceae, Secamoneae, from the Malagasy eastern lowland forest and from the Marojejy mountains in northeastern Madagascar, respectively. Both species are related to *Secamone tenuifolia* and *S. glaberrima* from the Central Plateau. The new species are described, illustrated, and compared with related taxa. A key to the eight species in the *Secamone tenuifolia* group is given.

Secamone R. Brown is a paleotropical genus of suffrutescent twiners or small scrambling herbs, rarely erect shrubs, with usually small white to yellow flowers. In a revision of *Secamone* in the Madagascar Region (Klackenberg, 1992), 56 species were recognized from Madagascar. Since then two additional species have been described from this island (Klackenberg, 1997, 1998). In the course of preparing the tribe Secamoneae for the *Flore de Madagascar et des Comores*, while examining recent material from the MO herbarium, I encountered two specimens from eastern Madagascar that do not fit in any of the hitherto known 58 species. The specimens were collected in the lowland at Nosy Mangabe and in the mountains in Marojejy, respectively. After morphological analysis it is evident that they represent two new species of *Secamone*. Both are herein described, illustrated, and given the names *Secamone schatzii* and *S. linearis*.

Both *Secamone schatzii* and *S. linearis* resemble *S. tenuifolia* Decaisne and *S. glaberrima* Schumann, two rather common species known from the Central Plateau. *Secamone tenuifolia* and *S. glaberrima* constitute, together with *S. dequairei* Klackenberg, *S. drepanoloba* Klackenberg, *S. sparsiflora* Klackenberg, and *S. unciformis* Klackenberg, a group of taxa characterized by having usually thick valvate corolla lobes that are finely tuberculate on their inner side. The staminal corona lobes are also usually tuberculate toward the base. The majority of the hitherto described species in this group further display a tuberculate lower leaf epidermis. However, this is a character absent in *Secamone glaberrima*, *S. sparsiflora*, and S. *unciformis*, as well as in the two new species *S. schatzii* and *S. linearis*.

In addition to the smooth lower leaf epidermis, *Secamone schatzii* and *S. linearis* have a leaf shape and venation similar to that of *S. glaberrima* and *S. sparsiflora*, respectively. Both *S. glaberrima* and *S. schatzii* are distinguished by mostly elliptic leaf laminae revealing only the midrib when dry, and by having strongly dorsiventrally flattened staminal corona lobes. In contrast, *Secamone sparsiflora* and *S. linearis* have narrow, mostly linear leaves, also with only the midrib visible when dry.

Secamone schatzii Klackenberg, sp. nov. TYPE: Madagascar. Toamasina, Nosy Mangabe in the Bay of Antongila, 5 km S of Maroansetra, 15°30′S, 49°46′E, 0–330 m, 2–19 Jan. 1990, *G. E. Schatz & E. Carlson 2941* (holotype, MO; isotypes, TAN not seen, WAG). Figure 1.

Species haec *Secamonae glaberrimae* similis foliis ellipticis subtus non tuberculatisque et lobis coronae dorsiventraliter applanatis, sed corollae lobis in aestivatione parum imbricatis et intra non subtiliter tuberculatis autem epidermide laevi vel coronae lobis brevioribus differt.

Liana with terete glabrous stems. Leaves opposite, herbaceous, entire, flat but at least when dry slightly revolute at the very margin, glabrous; blade ca. 4–6 × 1.5–2 cm, elliptic, cuneate at the base, acute at the apex; venation not visible except for the midrib when dry; midrib ± even with the leaf surface on both sides; epidermis smooth on both sides; petiole ca. 5 mm long. Inflorescences axillary or terminal, shorter than the adjacent leaves; cymes mostly dichasial, rather lax and with few flowers; axes ca. 5–10 mm long, mostly glabrous; pedicels 3–5 mm long; bracts 0.5–1.0 mm long, ciliate. Flowers pentamerous, actinomorphic. Calyx lobes only shortly connate, ca. 0.9–1.0 × 0.9 mm, almost orbiculate to broadly ovate, rounded at the apex, externally glabrous but ciliate, internally pubescent at base with a small gland (colleter) in each sinus. Corolla ellipsoid in bud and rounded at the apex, somewhat contorted with the left margins slightly overlapping, not twisted, fused for ca. 1/2 of its

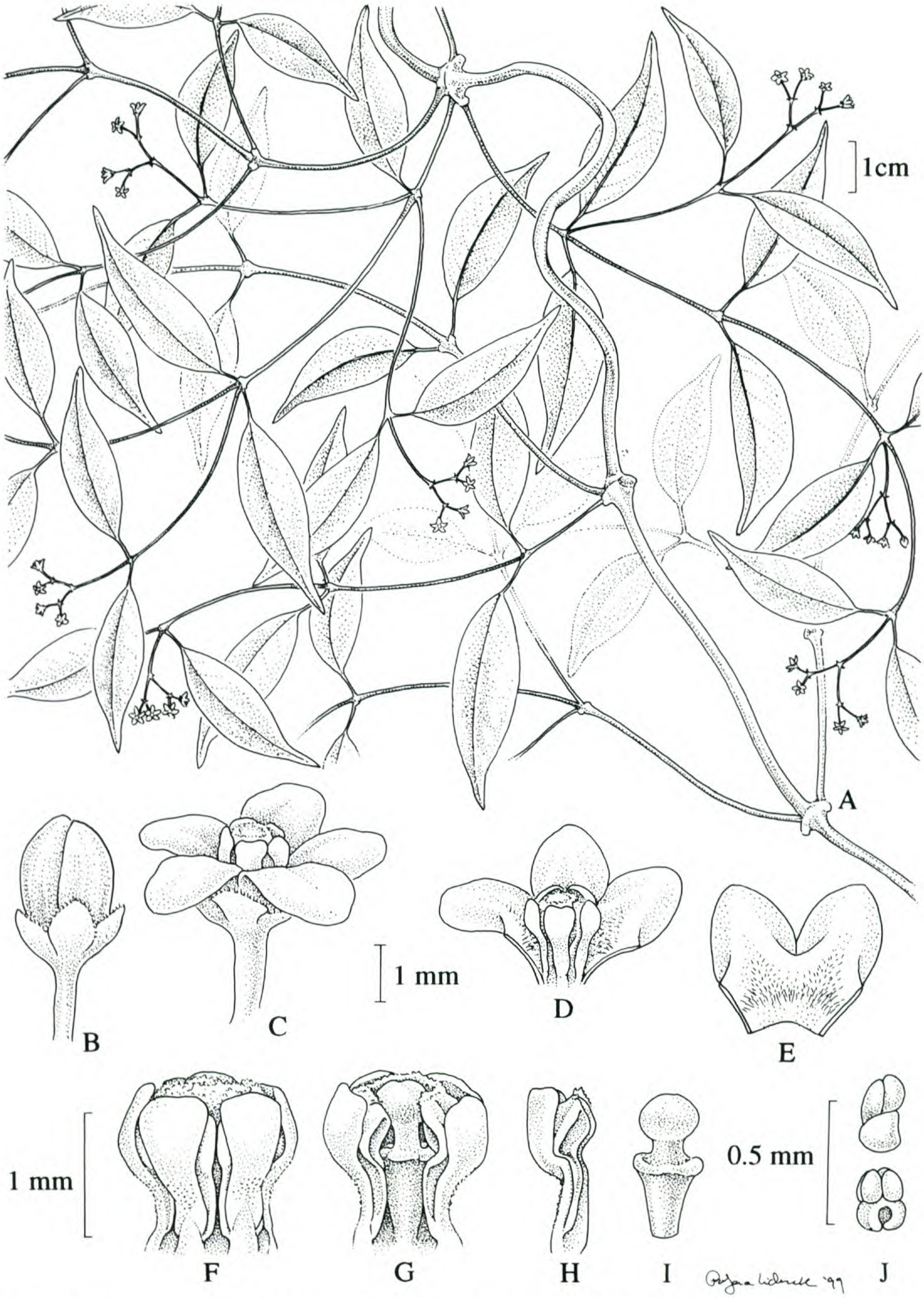

Figure 1. *Secamone schatzii* Klackenberg. —A. Habit. —B. Flower in bud. —C. Flower. —D. Gynostegium and portion of corolla. —E. Portion of corolla from within. —F. Gynostegium. —G. Gynostegium with one anther removed. —H. Anther, lateral side. —I. Style head. —J. Pollinarium, lateral side (top) and axial side. A–J, *Schatz & Carlson 2941*. Drawn by Pollyanna Lidmark, Stockholm.

length into a tube, hairy in the mouth, yellow-orange; tube ca. 1.3 mm long; lobes curved outward to almost rotate, ca. 1.3 × 1.5 mm, oblong to broadly ovate, obtuse at the apex, smooth. Corolline corona present in form of an epipetalous bilobed cushion in each lobe sinus. Staminal column ca. 1.2 mm high; connective produced into a membranous tip; filaments with horny margins (pollinium collectors) to the base. Staminal corona lobes ca. 0.7 mm long, dorsiventrally compressed and flat, about as long as the staminal column, somewhat arched, truncate at the apex; basal portion ± flat and finely papillate near the base, narrower than the lobe, attached from base along slightly more than half of the stamen. Pollinia minute, 2 in each anther loculus, ± ascending, ellipsoidal, 0.15–0.2 mm long. Ovary of two separate carpels, subinferior. Style absent. Style head ± equaling the staminal column; narrower upper part about as long as the lower broader part, ca. 0.6 mm long, slightly broadened at the apex. Fruits not seen.

Distribution and habitat. *Secamone schatzii* is only known from the type collection from Nosy Mangabe in the Bay of Antongila on the east coast of Madagascar. It was climbing to 16 m above ground into the canopy. It was collected in flower in January.

Secamone schatzii is known from low altitudes in the eastern rainforest zone, in contrast to *S. glaberrima*, which is generally distributed on the Central Plateau of Madagascar. Although similar in habit and in gross flower morphology, *Secamone schatzii* differs from *S. glaberrima* by its smooth (vs. papillate-tuberculate) inner surfaces of the corolla lobes, by having a ring of relatively short hairs in the corolla tube (vs. five distinct triangular patches of long retrorse hairs), by having the corona lobes more or less equaling the staminal column (vs. distinctly longer), and by the stigma head, which has subequal lower and upper portions (vs. twice as long lower portions). In addition, the corolla lobes of *S. schatzii* thin toward the margins. These margins further slightly overlap to the left when externally viewed. In contrast, *S. glaberrima*, *S. sparsiflora*, and *S. tenuifolia* all share corolla lobes that are more or less evenly thick to the margin in a distinctly valvate arrangement.

This species is named after George Schatz, Missouri Botanical Garden, who collected the only known material of this species during one of several inventory trips to Nosy Mangabe.

Secamone linearis Klackenberg, sp. nov. TYPE: Madagascar. Antsiranana, Réserve Naturelle Intégrale 12, Marojejy, au Nord d'Andapa, aux environs du sommet de l'Est, 14°29′S, 49°38′E, 1300–1500 m, 21–22 Jan. 1994, *F. Rasoavimbahoaka et al. 14* (holotype, MO; isotypes, S, TAN not seen). Figure 2.

Species haec *Secamonae tenuiflorae* et *S. sparsiflorae* similis foliis plus minusve linearibus et lobis corollae intra subtiliter tuberculatis; ab illa foliis subter non tuberculatis, a hac pedicellis brevioribus et habitu volubili, et a coronae duabus lobis distincte dorsiventraliter applanatis et corollae lobis non distincte valvatis autem parum imbricatis differt.

Liana with terete glabrous stems. Leaves opposite, herbaceous, entire, flat but at least when dry slightly revolute at the very margin; blade ca. 20–30 × 1–3 mm, linear to rarely narrowly ovate, attenuate at the base, acute to acuminate at the apex, glabrous; venation not visible except for the midrib when dry; midrib ± even with leaf surface above, ± even with leaf surface or slightly raised below; epidermis smooth on both sides; petiole ca. 1 mm long, sometimes with reddish hairs. Inflorescences axillary (sometimes appearing terminal), much shorter than the adjacent leaves; cymes di- to monochasial, rather dense with up to ca. 8 flowers; axes up to 5 mm long, covered with few reddish hairs, often more densely hairy along one or two sides; pedicels up to 1.5 mm long, usually hairy; bracts 0.5–1.0 mm long, usually broad, triangular. Flowers pentamerous, actinomorphic. Calyx lobes only shortly connate, ca. 0.6 × 0.9 mm, ovate, acute at the apex, glabrous outside but ciliate, hairy inside and with a broad gland (colleter) in each sinus. Corolla ellipsoid in bud and rounded at the apex, seemingly valvate but actually contorted with left margins slightly overlapping, not twisted, somewhat campanulate, fused for ca. 3/5 of its length into a tube, with long retrorse hairs in filled triangles below the mouth inside, white; tube ca. 1.3–1.9 mm long; lobes curved outward, ca. 1.9 × 1.3 mm, triangular, ± acute at the apex, thick, finely papillate inside, smooth outside. Corolline corona present in the form of an epipetalous bilobed cushion in each lobe sinus. Staminal column ca. 1.3 mm high; connective produced into a membranous tip; filaments with horny margins (pollinium collectors) to the base. Staminal corona lobes ca. 0.6 mm long, dorsiventrally compressed and flat, slightly longer than the staminal column, somewhat arched, truncate at the apex; basal portion ± flat, smooth, almost as broad as the lobe, attached from base along slightly more than half of the stamen. Pollinia minute, 2 in each anther-loculus, ± ascending, ellip-

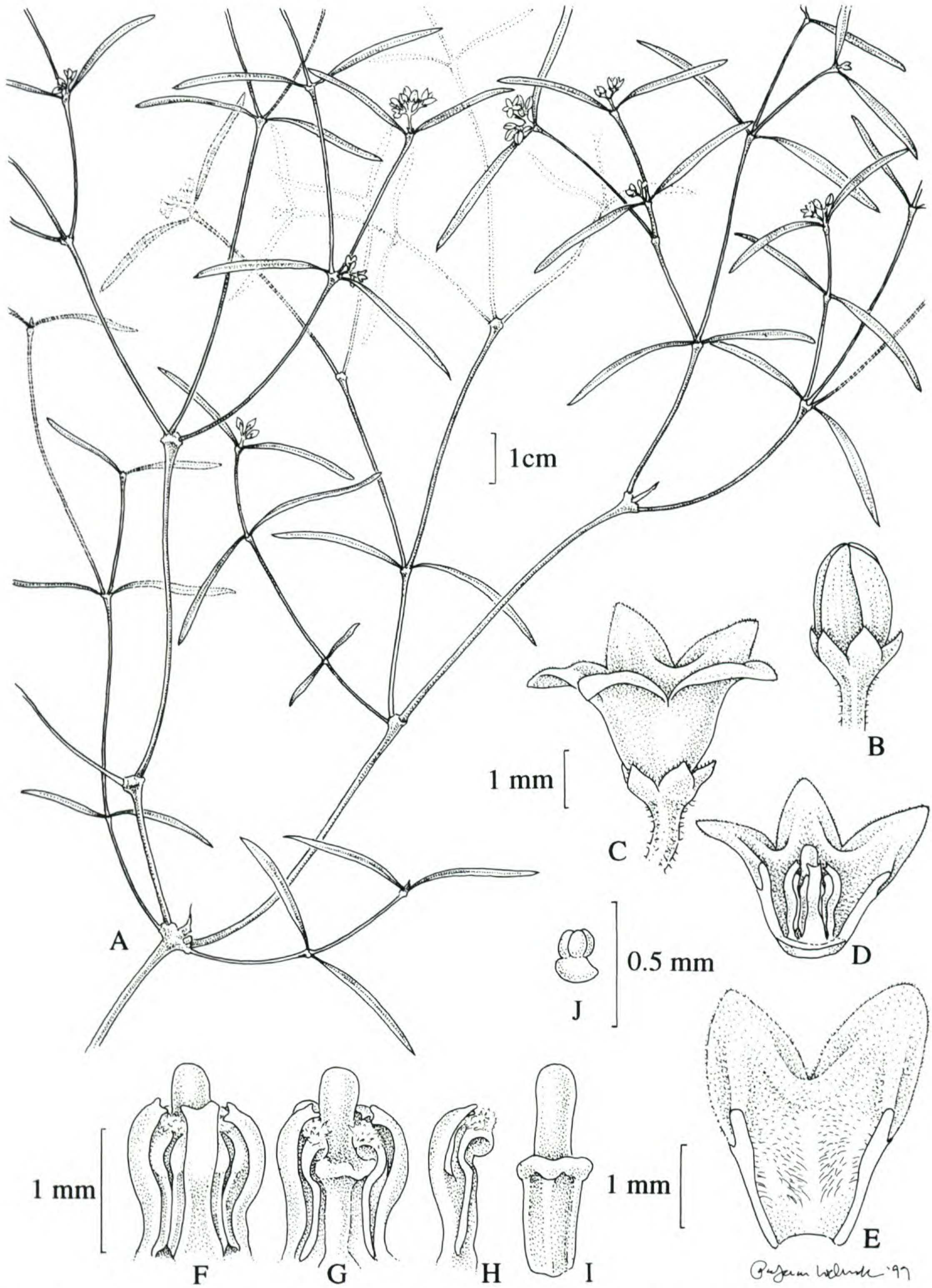

Figure 2. *Secamone linearis* Klackenberg. —A. Habit. —B. Flower in bud. —C. Flower. —D. Gynostegium and portion of corolla. —E. Portion of corolla from within. —F. Gynostegium. —G. Gynostegium with one anther removed. —H. Anther, lateral side. —I. Style head. —J. Pollinarium, lateral side. A–J, *Rasoavimbahoaka et al. 14.* Drawn by Pollyanna Lidmark, Stockholm.

soidal, 0.1–0.15 mm long. Ovary of two separate carpels, subinferior. Style absent. Style head projecting above the staminal column; narrower upper part slightly shorter than the lower broader part, ca. 0.5 mm long, cylindric, entire at the apex. Follicle (only gall-infested one seen) ca. 2.0 × 0.8 cm, narrowly ovoid, straight, glabrous. Seeds not seen.

Distribution and habitat. *Secamone linearis* is only known from the type collection from the Marojejy mountains at 1300–1500 m altitude. Habitat unknown. It was collected in flower in January.

Secamone linearis from the Marojejy mountains in the northeastern part of Madagascar most resembles *S. sparsiflora* from the Isalo mountains to the southeast. Both species probably represent isolated segregates of the rather common *Secamone tenuifolia*, whose wide distribution lies between *S. linearis* and *S. sparsiflora*. There is, however, a disjunction between *Secamone tenuifolia* and *S. linearis*, as *S. tenuifolia* has not been found north of the Antananarivo area (Klackenberg, 1992: 85), some 500 km south of the Marojejy mountains. Both *Secamone linearis* and *S. sparsiflora* lack the distinctly tuberculate-papillate lower leaf epidermis, but both share with *S. tenuifolia* narrow, usually linear leaves. *Secamone linearis* differs from *S. sparsiflora* by its shorter and hairy pedicels (1–1.5 mm vs. 3.5 mm long and glabrous), its reddish hairy inflorescence axes (vs. glabrous), a twining habit (vs. a shrubby one with erect or spreading branches), as well as by its dorsiventrally flattened and truncate staminal corona lobes (vs. acute to obtuse lobes, dorsally rounded, as seen in *S. sparsiflora* and *S. tenuifolia*). It has tuberculate-papillate inner surfaces of the corolla lobes, like *Secamone glaberrima*, *S. sparsiflora*, and *S. tenuifolia*, but differs from them in that the corolla lobes are not distinctly valvate. In this character it is instead more similar to *Secamone schatzii* in that the lobes become thinner toward the margins and are slightly overlapping each other with their left margins as seen from outside.

The epithet of this species alludes to the narrow leaves.

A key to the eight Malagasy species that constitute the *Secamone tenuifolia* group discussed in the text is presented below, also serving as a character synopsis:

1a. Leaves linear to narrowly elliptic.
  2a. Shrub with erect or spreading branches; inflorescences glabrous; pedicels more than 3.5 mm long . . . . . *S. sparsiflora*
  2b. Twiners; inflorescence axes and pedicels usually pubescent with reddish hairs; pedicels less than 3.5 mm long.
    3a. Leaf usually with reddish hairs below and with finely and densely tuberculate-papillate epidermis, seemingly powdered (fine-grained) (seen clearly with a lens at ×25); corolla distinctly valvate . . . . . *S. tenuifolia*
    3b. Leaf almost glabrous with lower epidermis smooth; corolla lobes somewhat contorted with left lobe margins slightly overlapping . . . . . *S. linearis*
1b. Leaves elliptic to ovate.
  4a. Leaves with midrib and primary nerves visible when dry; staminal corona lobes hook-like or sickle-shaped, cylindrical or laterally flattened toward apex.
    5a. Leaf underneath with smooth epidermis, not tuberculate-papillate; corona lobes hook-like, jutting out at ca. 90° from staminal column . . . . . *S. unciformis*
    5b. Leaf underneath with finely and densely tuberculate-papillate epidermis (lens ×25); corona lobes sickle-shaped, ± arched over staminal column.
      6a. Corolla lobes > 2 mm long; corona lobes (free part) > 1 mm long with the apices converging above staminal column, distinctly laterally flattened and sharp-edged at dorsal side, broadened only at the very base below the anther wings . . . . . *S. drepanoloba*
      6b. Corolla lobes < 2 mm long; corona lobes < 1 mm long and not converging above staminal column, somewhat laterally flattened but dorsally rounded . . . . . *S. dequairei*
  4b. Leaves with midrib only visible when dry; staminal corona lobes arched but ± dorsiventrally flattened toward apex.
    7a. Corolla lobes ± evenly thick to margin and valvate, with inner surface covered with white (when dry) fine papillae; corona lobes longer than staminal column . . . . . *S. glaberrima*
    7b. Corolla lobes becoming thinner toward margins and with left margins slightly overlapping, not finely papillate; corona lobes ± equaling staminal column . . . . . *S. schatzii*

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A New Species of *Gagnebina* (Leguminosae: Mimosoideae) from Madagascar

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ABSTRACT. A new species of *Gagnebina* from northern Madagascar, *G. bakoliae* Luckow & Du Puy, is described and illustrated. The new species is most similar to *G. bernieriana*, and shares with it features such as resting buds, dehiscent fruits, and pollen in 16-celled polyads. *Gagnebina bakoliae* differs from *G. bernieriana* in having the pinnae decrescent both apically and basally, the petiole densely tomentose adaxially but glabrous abaxially, and pods somewhat larger and darker in color.

Recent fieldwork in Madagascar by the authors has led to the discovery of a new species of *Gagnebina*. This genus is known from some six species, all of which are endemic to Madagascar and the nearby Comoros and Mascarene Islands. Traditionally circumscribed by indehiscent, winged fruits, *Gagnebina* was expanded by Lewis and Guinet (1986) to include any species with linear anthers. This involved the reassignment of several species that had previously been included in the closely related genus *Dichrostachys*. Both genera have staminodial flowers at the base of the inflorescence and centers of diversity in Madagascar. Recent cladistic analyses by the first author (Luckow, 1995) indicated that *Gagnebina* should further expand to encompass all those species with linear or subulate stipules if it was to be monophyletic. Another character correlated with stipule morphology, and mentioned by Lewis and Guinet (1986), is lack of the brachyblasts that characterize species of *Dichrostachys* and *Alantsilodendron*. In contrast, the species of *Gagnebina* discussed herein possess resting buds with perules. This may characterize the genus as a whole, although further work is needed to demonstrate that resting buds are present in all species in the genus.

Gagnebina bakoliae Luckow & Du Puy, sp. nov. TYPE: NW Madagascar. Antsiranana: Route Nationale 6, ca. 25 km NE of Ambilobe, near village of Ambilomagodro, close to Ankarana Massif, 49°07′E, 13°01′S, 220 m, 17 Nov. 1992, *G. P. Lewis, D. Du Puy & B. D. Schrire 2141* (holotype, K; isotypes, BH, P, TAN). Figure 1.

Gagnebinae bernierianae (Baillon) Luckow similis, sed petiolo et rachide dorsaliter glabris, ventraliter tomentosis, pinnis in rachide non valide accrescentibus, fructibus 10 cm usque longis et atrobadiis, et antheris ovato-sagittatis diversa.

Spindly shrub or small tree 2–5 m tall; young branches angled, pubescent on the edges with curly or spreading golden hairs; older branches terete, with smooth, mottled gray bark; brachyblasts absent, but resting buds present with 6 to 8 perulate scales, 5–6 × 1.5–2 mm, ovate, striate with raised nerves, glabrous, stramineous. Stipules dimorphic, those on the leaves formed just after the resting bud breaks oblong, 4–5 × 1.5–2 mm, acute apically, striate, stramineous, similar in color and texture to the resting bud scales, deciduous; stipules gradually becoming subulate distally on the branch, 6–9 × 0.5 mm, ± persistent, present on most flowering and fruiting branches. Leaves 6–12 cm long, the petiole, rachis, and pinnae adaxially tomentose with gray or stramineous hairs, abaxially glabrous, petiole 0.8–2 cm long, rachis (4)6–10 cm long; nectary 1.5 mm diam., sessile, crateriform, orbicular, borne between the proximal pair of pinnae, often between the terminal pair and sometimes between other pairs; pinnae (10)15 to 20(25) pairs per leaf, decrescent at both ends, 2–4 cm long, the axis usually forming a subulate point 1–2 mm beyond the insertion of the terminal pair of leaflets; leaflets 40 to 60(70) pairs per pinna, 2–3 × 0.35–0.5 mm, linear-falcate, acute, truncate-oblique basally, glabrous, sometimes ciliate, the nearly centric midvein visible on the dorsal surface. Peduncle 2–3 cm long, sparsely puberulent, in fruit becoming (2–)4–7 cm long, stout, woody; inflorescences axillary, one or, more frequently, two per node, each a congested spike of 40 to 75 flowers, 1–2 cm wide, the rachis 2.5–3 cm long, the proximal flowers sterile, the distal fertile. Bracteoles subtending each flower 1.5 mm long, carinate, linear, deciduous, ciliate, 1-nerved. Sterile flowers 7 to 20 per inflorescence, calyx shallowly cupulate, 0.5–1 mm long, constricted at the base to form a minute pedicel, the 5 lobes

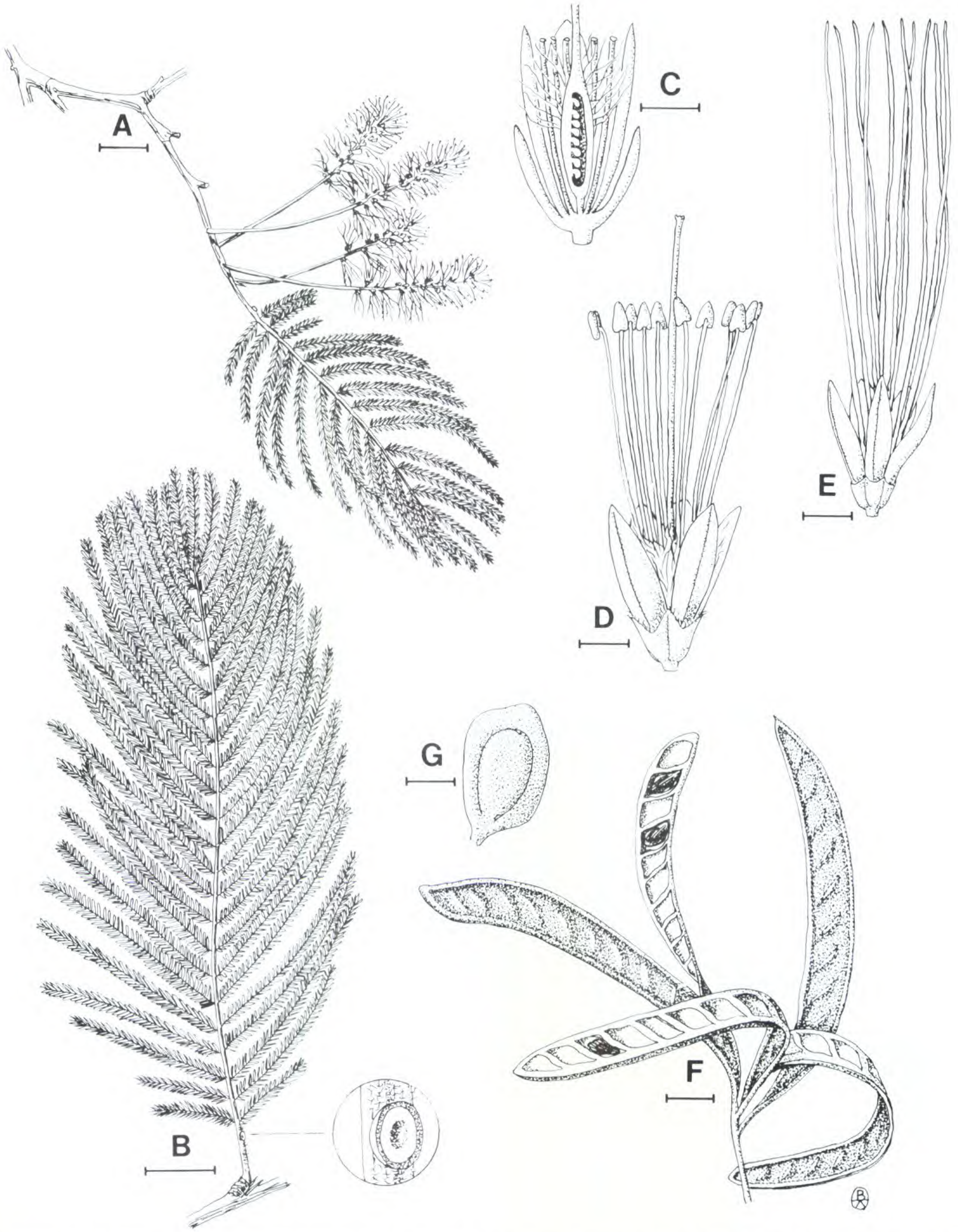

Figure 1. *Gagnebina bakoliae* Luckow & Du Puy. —A. Flowering branchlet. —B. Leaf with close-up of petiolar nectary. —C. Longitudinal section of fertile flower. —D. Fertile flower. —E. Sterile flower. —F. Infructescence. —G. Seed. Bars = 1 cm in A, B, F; 1 mm in C, D, E; 2.5 mm in G.

obtuse, centrally veined, ciliate, cream-white; petals 5, distinct, 1.5–2.5 mm long, lanceolate, membranous, 1-nerved, glabrous, cream-colored; staminodia 10, 1–1.5 cm long, white, filamentous. Perfect flowers with a perianth like that of the sterile flowers but larger, calyx 1–1.5 mm long, petals 2–3 × 0.7–1 mm; stamens 10, the filaments exserted 5–6 mm beyond the petals, anthers ovate-

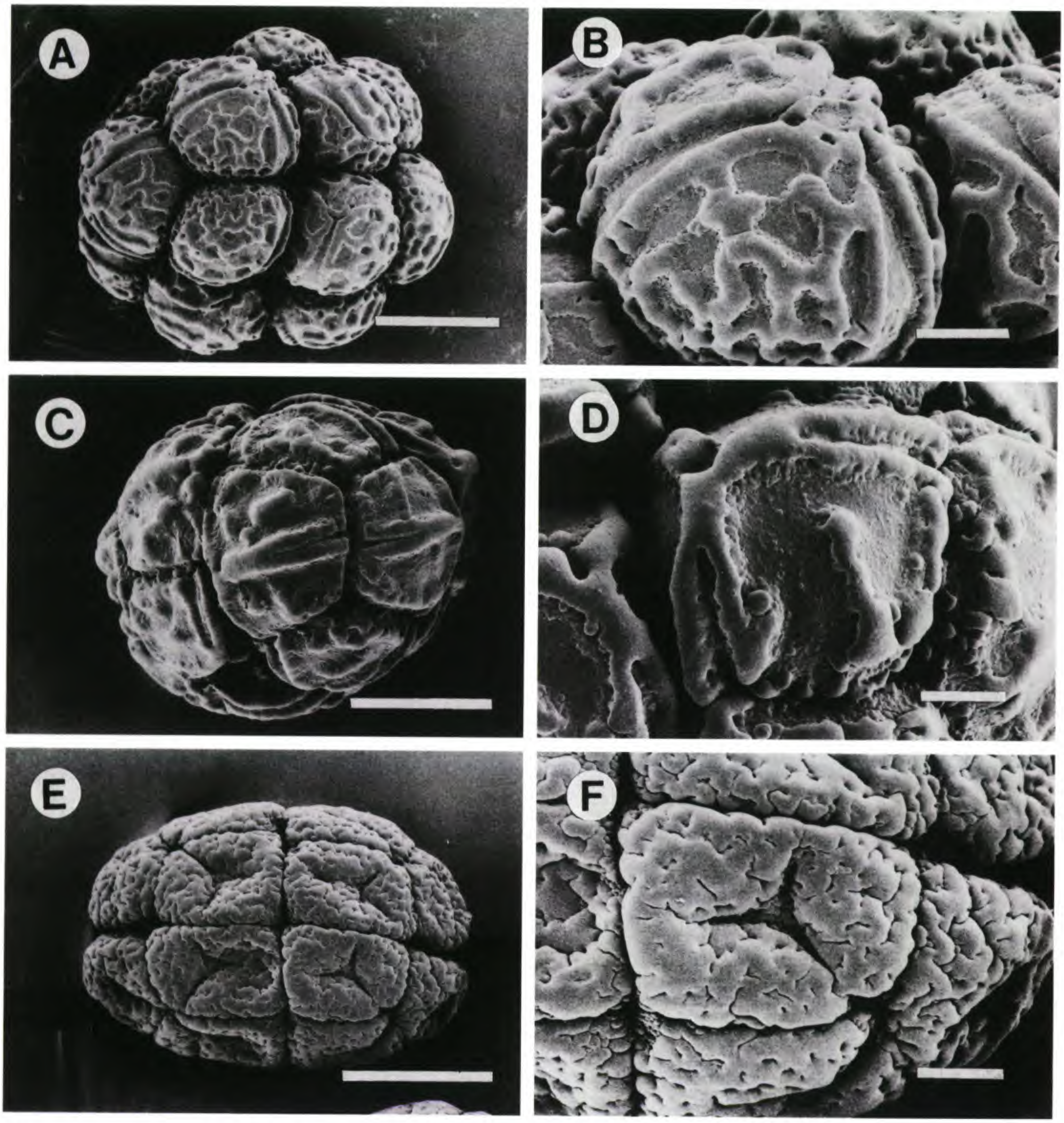

Figure 2. —A. Polyad of *Gagnebina bakoliae*. —B. Single grain from polyad of *G. bakoliae*. —C. Polyad of *G. bernieriana*. —D. Single grain from polyad of *G. bernieriana*. —E. Polyad of *G. myriophylla*. —F. Single grain from polyad of *G. myriophylla*. Bars = 20 μm in A, C, E; 5 μm in B, D, F.

sagittate, nearly basifixed, eglandular, light yellow; ovary 1–1.5 mm long, sessile or short-stipitate, densely white-pilose, style 6–7 mm long, stigma porate. Pods 1 to 4 per peduncle, sessile, 5–10 × 0.7–1.2 cm, woody, lanceolate, acute at both ends, each valve 1.5–2 mm thick, the sutural ribs 1.5–2 mm wide, the replum 6–8 mm wide at the center, sunken between the ribs and often splitting diagonally over the seeds on old pods; seeds 6 to 12 per pod, obliquely inserted, 7–9 × 5–6 mm, ovate-rhomboidal, castaneous, pleurogram nearly complete, endosperm thin.

Distribution. Northern Madagascar, Ankarana, in dry deciduous woodland and riverine forests, usually bordering streams, on limestone outcrops and rocky soils, 90–220 m.

Phenology. Flowering November, fruiting March.

Common names. Hazomburona, Famoha; wood used for building houses.

This species is named in honor of our friend and colleague at the University of Antananarivo, Bakolimalala Rakouth. *Gagnebina bakoliae* is intermediate in some characters between *G. bernieriana*

and *G. myriophylla* (Baker) G. P. Lewis & Guinet. The new species and *G. bernieriana* have both been grown from seed in the greenhouses at Cornell, and they are found to differ consistently in the following characteristics. The pinnae of *G. bernieriana* are strongly accrescent, with the distal pair 3–4 times as long as the proximal pair. In contrast, the distal pinnae of *Gagnebina bakoliae* are decrescent (Fig. 1). The petiole and rachis of *G. bakoliae* are densely tomentose adaxially but nearly glabrous abaxially, whereas the petiole and rachis of *G. bernieriana* are pubescent (but not usually tomentose) throughout. Although pod sizes overlap in their overall ranges, pods of *G. bakoliae* are on average larger than those of *G. bernieriana* (7–10 cm vs. 5–7 cm, respectively). The seeds of *G. bakoliae* are also larger (7–9 mm vs. 5–6 mm). The apex of the valves of *G. bakoliae* is often nearly symmetrically acute, while that of *G. bernieriana* is strongly asymmetrical. The fruits also differ in color: those of *G. bakoliae* are a deep chocolate-brown; those of *G. bernieriana* a lighter golden-brown. Although flowers and inflorescences of the two species are very similar, the anthers of *G. bernieriana* are oblong-sagittate whereas those of *G. bakoliae* are ovate-sagittate.

Gagnebina bakoliae can also be confused with *G. myriophylla*, especially in fruiting condition. *Gagnebina myriophylla* is known only from northwestern Madagascar in the Sambirano region. The anthers of this species are linear and bear a terminal apiculus. The fruits are very similar to those of *G. bakoliae*, but are somewhat smaller (4–6 cm long) and thicker.

Because Lewis and Guinet (1986) had found pollen to be a useful character in *Gagnebina*, we examined several pollen samples from the three species using scanning electron microscopy (Fig. 2). The pollen of *G. bakoliae* is usually in 16-celled polyads, although occasionally 12 to 20 grains per polyad were observed (Fig. 2a). The exine is coarsely reticulate and tricolporate (Fig. 2b). It is most similar to that of *G. bernieriana*, which also has a 16-celled polyad but a more irregularly reticulate exine and colpi either obscure or non-polar (Fig. 2c, d). The pollen of *G. myriophylla* (Fig. 2e, f) is quite different, with rugulate exine and vestigial central syncolpi.

Paratypes. MADAGASCAR. **Antsiranana:** Besaboba, near Ankarana, on Rte. 6, 13 Mar. 1993, *M. Luckow 4225* (BH, K); Ankarana Special Reserve, 14 Mar. 1993, *M. Luckow 4231* (BH, K).

Acknowledgments. This work was supported by National Geographic grant 5800-96 and NSF grant DEB-9726981 to M. Luckow. We thank Bente King for the drawing, the Missouri Botanical Garden Madagascar Program for logistical support, ANGAP for collecting permits, and Bill Dress for the Latin diagnosis.

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Three New Brazilian Species in the Genus *Marcetia* (Melastomataceae, Melastomeae)

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Abstract. Three new species of *Marcetia* are described and illustrated. *Marcetia semiriana* occurs only in Serra do Cipó, Minas Gerais. *Marcetia shepherdii*, collected in Maraú, at sea level, and *M. lychnophoroides*, from Chapada Diamantina, are both endemic to Bahia. The new species *Marcetia shepherdii* and *M. lychnophoroides*, together with *M. luetzelburgii* Markgraf, constitute a group of closely related species. They share in common subcoriaceous, fleshy, imbricate to subimbricate, revolute leaves. *Marcetia shepherdii* is distinguished by its rigid, erect branchlets, yellowish green leaves that are glabrous on the adaxial surface, unappendaged and broadly dilated connectives, linear-oblong thecae with a ventrally inclined pore, and a unique 2-locular ovary. *Marcetia lychnophoroides* has velutinous to sublanate branchlets, cinereous-green leaves that are densely puberulous-sericeous on the abaxial surface, unprolonged and inconspicuously bilobulate connectives, and a 3- or 4-locular ovary. *Marcetia semiriana* is very similar to *M. taxifolia* (A. Saint-Hilaire) DC., differing in the prostrate branches, long pedunculate flowers, and straight anthers.

Marcetia is a neotropical genus of 27 species largely endemic to Brazil. Except for the widespread *Marcetia taxifolia*, which has a bicentric distribution in eastern Brazil and northwestern South America (Colombia, Venezuela, and Guyana), all other species of *Marcetia* have restricted distributions. *Marcetia* species are usually shrubs or subshrubs that occur in campo rupestre in the Serra do Espinhaço, Minas Gerais, in the mountains of Goiás, and especially in the Chapada Diamantina, Bahia. Campo rupestre is an exclusively Brazilian complex mosaic of vegetation types characterized by extensive outcrops of highly acidic rocks, nutrient-poor soils, and local variations in topography, slope, aspect, and moisture regime. A few *Marcetia* species occur in both montane and littoral areas, such as *M. ericoides* (Sprengel) O. Berg ex Cogniaux and *M. canescens* Naudin. *Marcetia shepherdii* is the only species in the genus that is endemic to coastal Bahia, where it occurs in the sandy vegetational formation commonly referred to as restinga. The genus *Marcetia* can be distinguished within the tribe Melastomeae mainly by the combination of tetramerous flowers and simple anthers that lack basally prolonged connectives (except in *M. shepherdii*) and, in some species, may have short ventral tuberculate appendages.

Three of the species studied in my taxonomic revision of *Marcetia* (Martins, 1989) are new. They are described and illustrated here.

Marcetia shepherdii A. B. Martins, sp. nov. TYPE: Brazil. Bahia: Maraú, 4 km de Maraú, 12 Mar. 1977 (fl, fr), *G. J. Shepherd, L. S. Kinoshita, J. B. Andrade & N. Taroda 4550* (holotype, UEC). Figure 1.

Haec species *Marcetiae luetzelburgii* affinis, sed ab ea foliis arcte adpressis sessilibus revolutis dense imbricatis internodia brevia occultantibus, ramis basin versus denudatis, conspicue annulis foliorum delapsorum praeditis, lamina foliari supra glabra in sicco flavovirescenti, staminum filamentis ter longioribus, antheris apice rotundato ventraliter minute dehiscenti atque ovario biloculari differt.

Erect subshrub ca. 60 cm, compactly branched; branchlets rigid, subterete to inconspicuously quadrangular, moderately puberulous or nearly glabrous, at the base defoliating with age and with conspicuous leaf scars. Leaves opposite, sessile, appressed, densely imbricate and concealing the short internodes; blade lanceolate-ovate, 2.5–3 × 1 mm, fleshy-coriaceous, basally cordate, apically recurved and mucronulate, margins revolute, glabrous on the adaxial surface, glandular-pubescent abaxially, obscurely 1-nerved. Flowers 4-merous, subsessile, solitary in upper leaf axils resembling a terminal foliaceous spiciform inflorescence, becom-

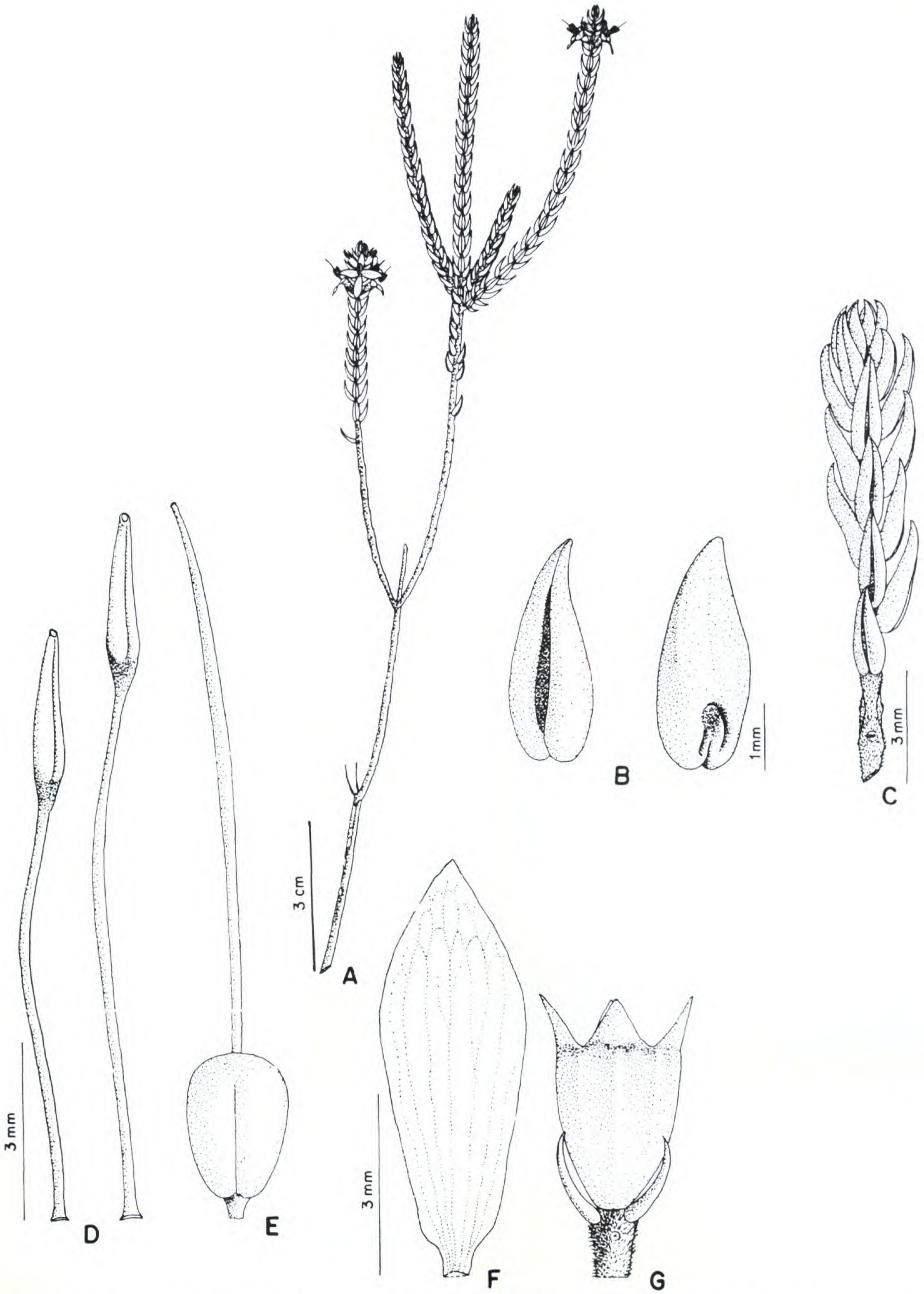

Figure 1. *Marcetia shepherdii* A. B. Martins. —A. Flowering branch. —B. Leaves, abaxial (left) and adaxial (right) surfaces. —C. Branchlet apex. —D. Antipetalous stamen (left) and antisepalous stamen (right). —E. Ovary and style. —F. Petal. —G. Hypanthium with bibracteolate pedicel and calyx. (A–G drawn from *Shepherd et al. 4550.*)

ing axillary by overtopping growth; bracteoles ca. 1 mm long, similar to the leaves; hypanthium campanulate, 2–2.5 mm long, glabrous; calyx lobes triangular, ca. 1 mm long, with acute to subrotund apex, glabrous, minutely glandular-ciliolate at the margins; petals obovate-oblong, 6–6.5 × 1.5–2 mm, pink to lavender, base shortly attenuate, apex acute; stamens subisomorphic, the antisepalous slightly longer; filaments 9–10 mm; thecae ca. 3.5 mm, linear-oblong, straight, with a small ventrally inclined pore, the connective shortly prolonged and broadly dilated below the thecae, ± continuous with the filament, unappendaged. Ovary superior, 2.5 mm long, glabrous, 2-locular; style 10–12 mm long, glabrous; stigma not expanded. Capsule elliptic, flattened, 2.5–3 mm long, enveloped by hypanthium and calyx; seeds cochleate, ca. 0.5 mm long, numerous, testa tuberculate.

This species is named after George J. Shepherd, Professor of Botany at UNICAMP (Universidade Estadual de Campinas), who collected the type and only known collection of this species.

Sterile plants of *Marcetia shepherdii* closely resemble *M. luetzelburgii* Markgraf. *Marcetia shepherdii* has rigid, erect branchlets, while in *M. luetzelburgii* the branchlets are more flexuous. The leaves, which are superficially similar in these two species, are much more appressed in *M. shepherdii* than in *M. luetzelburgii.* In *M. shepherdii* they are glabrous on the upper surface and yellowish green. Useful morphological characters in distinguishing these two species can be also found in the stamens and ovary. *Marcetia shepherdii* has much longer filaments (9–10 mm) than *M. luetzelburgii* (2–3 mm). In the new species the connectives are unappendaged, shortly prolonged, broadly dilated below, and the thecae are linear-oblong and rounded at the apex, with a small ventrally inclined pore. Its ovary is 2-locular, a unique feature in this genus where the usual condition is a 4- to 3-locular ovary. In contrast, *Marcetia luetzelburgii* has linear-triangular thecae with a beaked, dorsally inclined apex, a staminal connective that is barely prolonged with ventral appendages, and a 3-locular ovary.

The distribution of *Marcetia shepherdii* is apparently confined to Maraú, Bahia. The only available specimen was collected at sea level, on a "mata de restinga" border. The species may be rare as only one specimen has been collected. However, this coastal region of Bahia, which is experiencing widespread destruction, is still poorly known botanically.

Marcetia lychnophoroides A. B. Martins, sp. nov. TYPE: Brazil. Bahia: Caeté-Açu, Cachoeira Glass, 30 June 1983 (fl), *L. Paganucci de Queiroz 702* (holotype, HUEFS; isotypes, ALCB, SP). Figure 2.

Haec species ad *Marcetiam shepherdii* et *M. luetzelburgii* foliis confertis crasse coriaceis satis revolutis accedit, autem ab ambabus non solum foliis longioribus et habitu robustiore, sed etiam antherarum connectivorumque forma maxime distincta.

Erect much-branched shrub 1–1.3 m; branchlets subterete to obscurely quadrangular, densely covered with velutinous to sublanate or sericeous trichomes, cinereous to canescent, glabrescent and defoliating with age at the base, the leaf scars conspicuously alveolate. Leaves opposite, sessile, subappressed and densely imbricate; blade lanceolate-ovate, 8–10 × 2–2.5 mm, cinereous-green, subcoriaceous to fleshy coriaceous, base rounded to subcordate, apex shortly blunt-acuminate, margins totally revolute, sparsely puberulous and obscurely striolate on the adaxial surface, densely puberulous-sericeous abaxially, 1-nerved. Flowers 4-merous, subsessile, solitary, in upper leaf axils, resembling terminal foliaceous spiciform inflorescences, pedicels ca. 0.5 mm; bracteoles naviculate, 3–4 × 1 mm, similar to the leaves, the margins strongly revolute; hypanthium oblong-campanulate, ca. 4 mm long, moderately puberulous; calyx lobes linear to narrowly triangular, ca. 4 × 1 mm, apex acuminate, puberulous beneath; petals obovate, 7–8.5 × 3–4 mm, lavender, base attenuate, apex subabruptly acute; stamens slightly dimorphic in size, antisepalous ca. 9 mm, antipetalous ca. 8 mm; thecae 4–4.5 mm long, linear-oblong with a small ventrally inclined pore, the connective not or slightly prolonged and inconspicuously bilobulate ventrally at base; ovary oblong, 3- or 4-locular, superior, glabrous; style 15 mm, glabrous; stigma not expanded. Capsule 4–5 mm long, enveloped by the tardily caducous hypanthium and calyx; seeds cochleate, ca. 0.6 mm long, numerous, testa tuberculate.

Marcetia lychnophoroides belongs to an informal group of species that includes *M. shepherdii* and *M. luetzelburgii.* All of these species share subcoriaceous to fleshy, densely imbricate, one-nerved leaves with margins that are uniformly revolute. Distinguishing characters of the new species include its velutinous to sublanate branchlets, longer leaves, anthers, and connectives.

Marcetia lychnophoroides differs notably from *M. shepherdii* in its 3- or 4-locular ovary, and unprolonged or slightly prolonged connective that is minutely bilobulate at the base. In *M. shepherdii* the

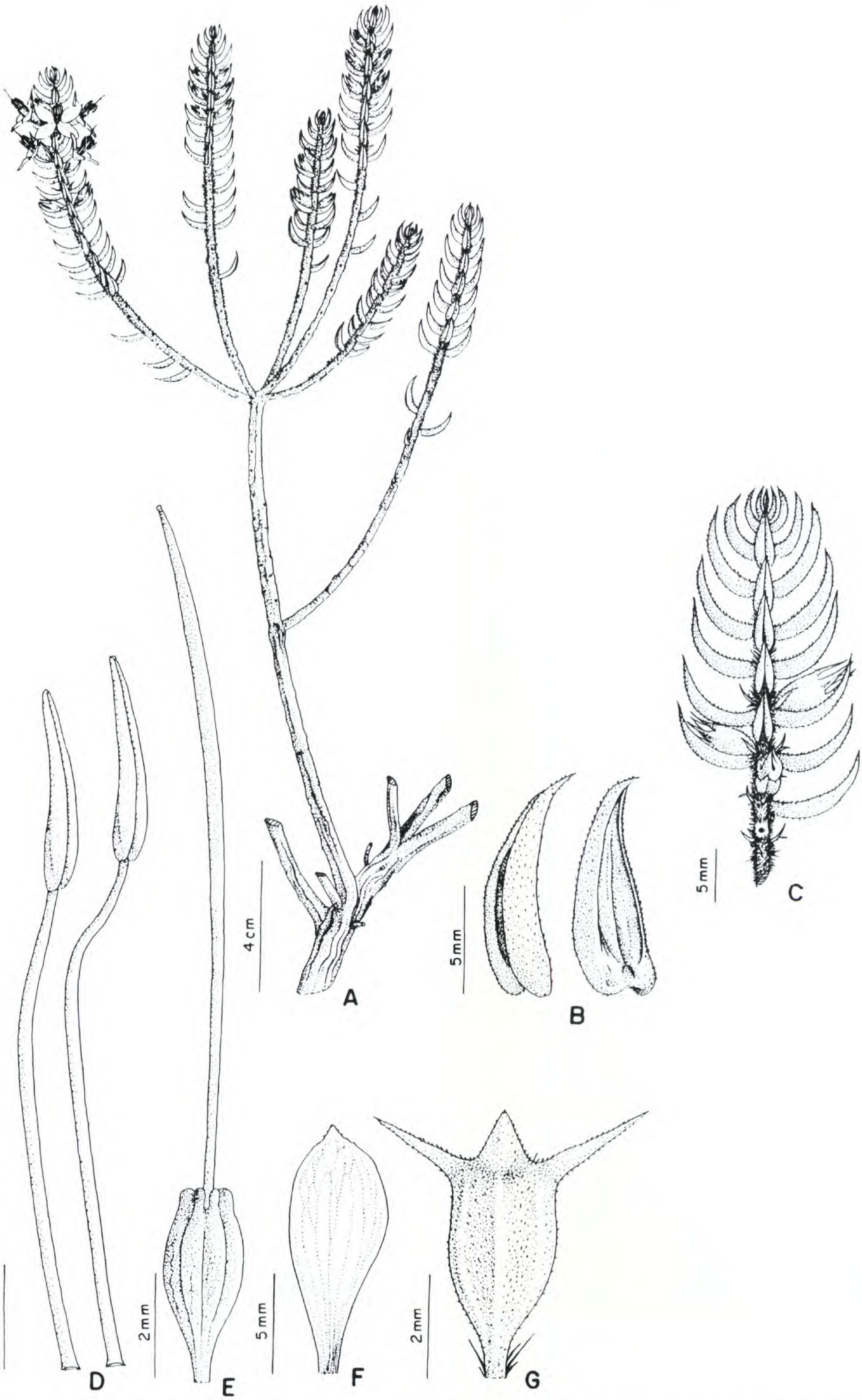

Figure 2. *Marcetia lychnophoroides* A. B. Martins. —A. Flowering branch. —B. Leaves, abaxial (left) and adaxial (right) surfaces. —C. Branchlet apex. —D. Antipetalous stamen (left) and antisepalous stamen (right). —E. Ovary and style. —F. Petal. —G. Hypanthium and calyx. (A–G drawn from *Paganucci de Queiroz 702*.)

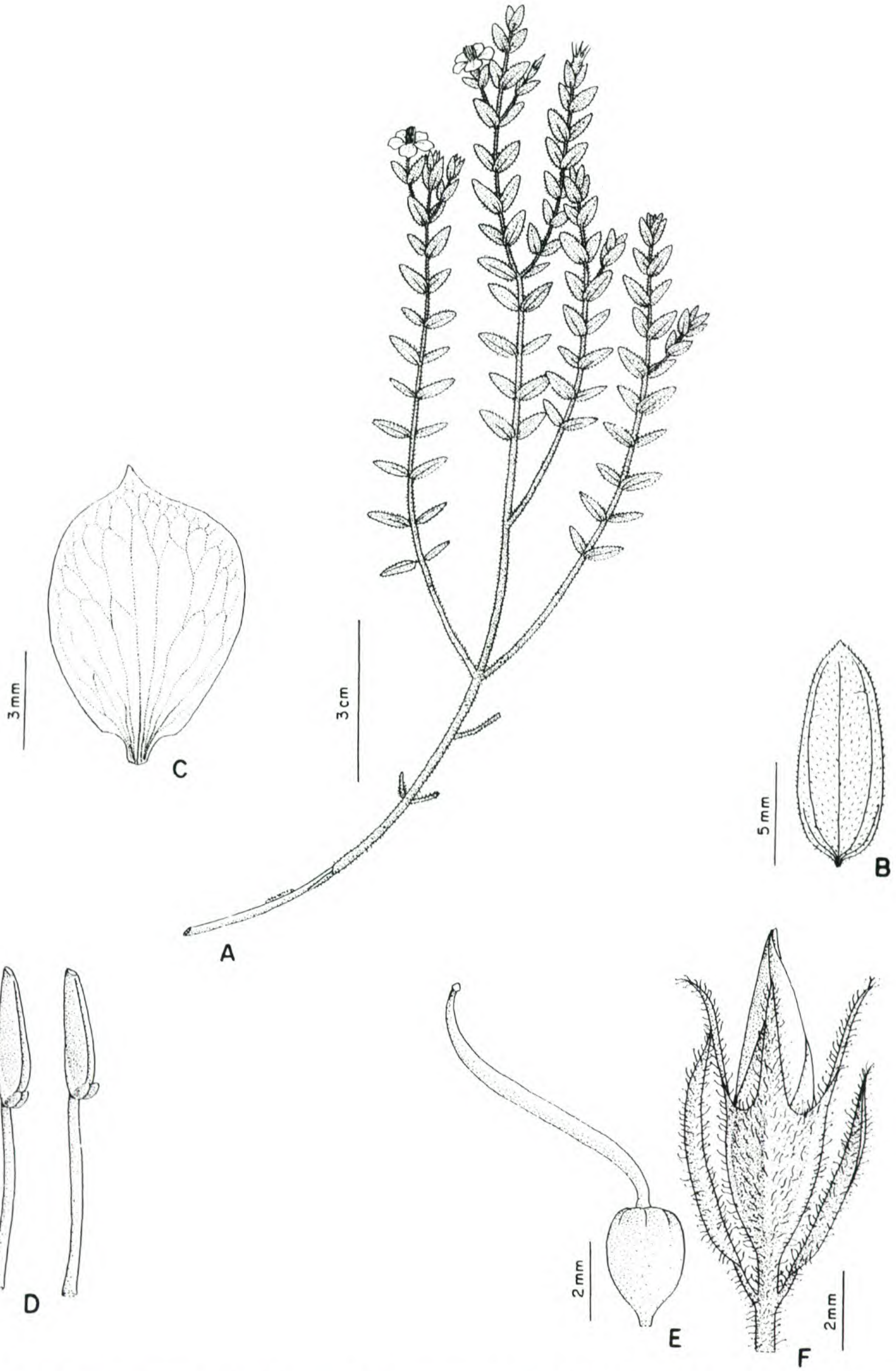

Figure 3. *Marcetia semiriana* A. B. Martins. —A. Flowering branch. —B. Leaf, adaxial surface. —C. Petal, adaxial surface. —D. Antipetalous stamen (left) and antisepalous stamen (right). —E. Ovary and style. —F. Bud showing hypanthium with bibrateolate pedicel and calyx. (A–F drawn from *Daniel & Hensold 2294*.)

ovary is 2-locular with the connective consistently prolonged. The two species also differ markedly in distribution and habitat. *Marcetia shepherdii* is presently known only from the restinga vegetation, at sea level, while *M. lychnophoroides* is endemic to the campos rupestres on the higher mountains of Chapada Diamantina, in interior Bahia. *Marcetia lychnophoroides* differs from *M. luetzelburgii* by its longer anthers that are linear and lacking the tubular dorsally inclined apex that characterizes *M. luetzelburgii*.

The epithet *lychnophoroides* emphasizes the similarity of sterile individuals of this species to some species in the genus *Lychnophora* Martius (Asteraceae). The Greek words *lychnis* for lamp, *phorus* for bearing, and *oides* for resembling were joined to describe the branching habit of the plant, which looks like a candelabra.

Paratypes. BRAZIL. **Bahia:** Barra da Estiva, 9 km ao sul da cidade, estrada para Ituaçu, 13°24′S, 14°18′W, 19 Oct. 1988 (fr), *R. M. Harley* 26925 (UEC); Palmeiras, próximo a Caeté-Açu, Cachoeira da Fumaça (Glass), 11 Oct. 1987 (fr), *Paganucci de Queiroz 1955* (ALCB, CEPEC, F, HBR, HUEFS, K, NY, RB, SP, UEC, US).

Marcetia semiriana A. B. Martins, sp. nov. TYPE: Brazil. Minas Gerais: Santana do Riacho, rocky slopes in the vicinity of Alto dos Palacios along the road from Chapeu do Sol to Conceição do Mato Dentro in the Serra do Cipó, elev. ca. 1200–1400 m, 14 Feb. 1982 (fl, fr), *T. Daniel & N. Hensold 2294-CFCR 3700* (holotype, SPF; isotypes, CAS, UEC). Figure 3.

Haec species primo aspecto *Marcetiae taxifoliae* similis sed ab ea caule prostrato, floribus longe pedunculatis, staminum filamentis stylisque brevioribus et antheris rectis differt.

Lax or diffuse subshrub 15–20 cm tall; branches subquadrangular, flexuous, prostrate, the young branchlets, leaf blades on both surfaces, hypanthium, and calyx lobes sparsely puberulous-glandular. Leaves subsessile; petiole 0.7–1.2 mm long; blade oblong-elliptic 6–10 × 2–6 mm, membranous, flat, base subrounded-obtuse, apex obtuse short-acuminate, margins glandular-ciliolate, 3- to 5-nerved. Flowers 4-merous, solitary in upper leaf axils; pedicels ca. 1 mm long; peduncles 4–5 mm long; bracteoles 4–5 × 1.5–2 mm, similar to the leaves, obscurely 3-nerved; hypanthium narrowly campanulate, 2–3 mm long; calyx lobes oblong-lanceolate to triangular, 2.5–3 × 0.5–0.8 mm; petals broadly obovate to elliptic 7–8 × 5–6 mm, lavender to pink, base attenuate, apex obtuse-apiculate usually with a single gland-tipped hair; stamens isomorphic with straight anthers, thecae oblong, 2–3 mm long, with a small ventral-terminal pore, the connective slightly prolonged, ventrally minutely bilobulate at the base; ovary elliptic, 2.5 mm long, superior to slightly attached to the hypanthium at the base, 4-locular, glabrous; style 6–7 mm, glabrous; stigma not expanded. Capsule 3.5–4 mm, covered by the persistent hypanthium and calyx; seeds cochleate, 0.4 mm long, numerous, testa tuberculate.

Marcetia semiriana is named for my friend and colleague João Semir, Professor of Botany at UNICAMP, who was my initial mentor in my studies of the Melastomataceae.

Marcetia semiriana can be confused with flat-leaved specimens of *M. taxifolia*, the only species in the genus that grows sympatrically with *M. semiriana*. The widespread *M. taxifolia* is quite variable, and several forms can be distinguished on the basis of foliage characters alone. None display the prostrate habit, long peduncles, shorter filaments and style, or smaller straight anthers of *M. semiriana*. *Marcetia hatschbachii* A. B. Martins, endemic to Grão-Mogol in Minas Gerais, resembles *M. semiriana*, but can be separated by a few constant characters. Of these the most significant are features similar to those distinguishing *M. semiriana* from *M. taxifolia*. In addition, *M. hatschbachii* is distinguished from *M. semiriana* by the ventral location of the anther pores and the petiolate leaves.

Paratypes. BRAZIL. **Minas Gerais:** Município de Santana do Riacho, Val da Lagoa, 22 Feb. 1986 (fl, fr), *Chukr et al. s.n., CFSC 9624* (SPF); Serra do Cipó, Km 132, 24 Apr. 1950 (fl, fr), *Duarte 2647* (US); Rodovia Belo Horizonte-Alto do Palácio, caminho para a Cachoeira, 16 Jan. 1988 (fl), *N. L. Menezes & P. Morales s.n., CFSC 10852* (SPF, UEC).

Acknowledgments. I thank Frank Almeda for reviewing the manuscript, Eduardo Kickhöfel for preparing the line drawings, and FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo) for the doctoral grant.

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Griffinia alba (Amaryllidaceae), a New Species from Northeastern Brazil

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ABSTRACT. *Griffinia alba* is described as new from Tapera, Pernambuco, in northeastern Brazil. It is most similar to the type species for the genus *Griffinia*, *G. hyacinthina*, which is known from the states of Rio de Janeiro and São Paulo in southeastern Brazil. It differs from this species by its cuneate leaf bases, and more numerous, entirely white flowers with longer pedicels and narrower tepals. *Griffinia alba* is the first white-flowered species to be described in subgenus *Griffinia*.

RESUMO. *Griffinia alba* é descrita como uma nova espécie do município de Tapera, Pernambuco, Brasil. *Griffinia alba* é mais semelhante na forma à *G. hyacinthina*, que é encontrada nos estados do Rio de Janiero e São Paulo. Difere desta pela base cuneada da folha, flores inteiramente brancas mais numerosas com pedicelos mais longos, e tépalas mais estreitas. *Griffinia alba* é a primeira *Griffinia* com flores cor de branco descrita no sobgênero *Griffinia*.

The most recent taxonomic treatment of the genus *Griffinia* Ker Gawler (Amaryllidaceae) recognizes six species (Traub & Moldenke, 1949). However, since that time the genus *Hyline* Herbert, composed of two species, has been reduced to a subgenus of *Griffinia* (Ravenna, 1969), and an additional four species belonging to subgenus *Griffinia* have been described (Morel, 1960; Ravenna, 1969, 1974, 1978). The genus is unique in the Amaryllidaceae for the presence of a true hypanthium, formed by the continuation of the perigonal tube over the ovary in some of the species (Ravenna, 1969; Preuss, 1999). Phylogenetic analyses based on nuclear rDNA ITS sequences resolve *Griffinia* as sister group to the monotypic *Worsleya rayneri* (Hooker f.) Traub & Moldenke, also endemic to Brazil (Meerow et al., 2000; Preuss, 1999).

Griffinia is marked by its petiolate and sometimes white or silver-spotted leaves, its turgid seed lacking phytomelan, and blue range pigmentation in the flowers (subg. *Griffinia*), a character shared with *Worsleya*. All species that we have examined have $2n = 20$ chromosomes, with frequent triploidy ($2n = 30$) characteristic of cultivated relicts of extirpated populations (Preuss, 1999). *Griffinia* is native to the various forest ecotypes of the Mata Atlântica and the nearby northeastern regions of the Caatinga Province (Oliveira-Filho & Ratter, 1995). *Griffinia* subg. *Griffinia* is characterized by small to large, diurnal, strongly zygomorphic, lilac, or lilac and white-colored flowers with the upper stamen assurgent and separated from the other declinate five (or sometimes obsolete). This subgenus occupies moist tropical forest habitats of the Mata Atlântica, or Brazilian Atlantic Forest, ranging from the state of Pernambuco in the north to the state of São Paulo in the south. *Griffinia* subg. *Hyline* has fragrant, large, nocturnal, white-colored flowers, and occupies a more xeric habitat such as the deciduous cerrado forests found in Goiás and Tocantins and the *caatinga* woodlands of the northeast region. Belonging to subgenus *Griffinia*, *G. alba* is described as new from Tapera, Pernambuco, and is the only species of *Griffinia* known to occur in that state.

Griffinia alba K. Preuss & Meerow, sp. nov. TYPE: Brazil. Pernambuco: Tapera, wooded habitat, 16 Nov. 1936, *B. Pickel 2907* (holotype, US). Figures 1, 2.

Haec species *Griffiniae hyacinthinae* Ker Gawler affinis, sed ab ea floribus albis, amplioribus, pedicellis longioribus, atque foliis basi anguste cuneatis differt. Habitat in silvis Taperae, Pernambuco, Brazil.

Bulbous terrestrial geophyte to ca. 50 cm tall (Fig. 1A). Bulb tunicate with contractile roots; tunics thin, drying brown, and becoming papery. Leaves distichous (Fig. 1A), petiolate; petiole to 30 cm long; lamina (Fig. 1B) ovate to elliptic, to ca. 40 cm long and 12–15 cm broad, margin entire, apex acuminate, base cuneate and gradually tapering into the petiole, with prominent transverse reticulate venation (Fig. 1C), glabrous adaxially, glau-

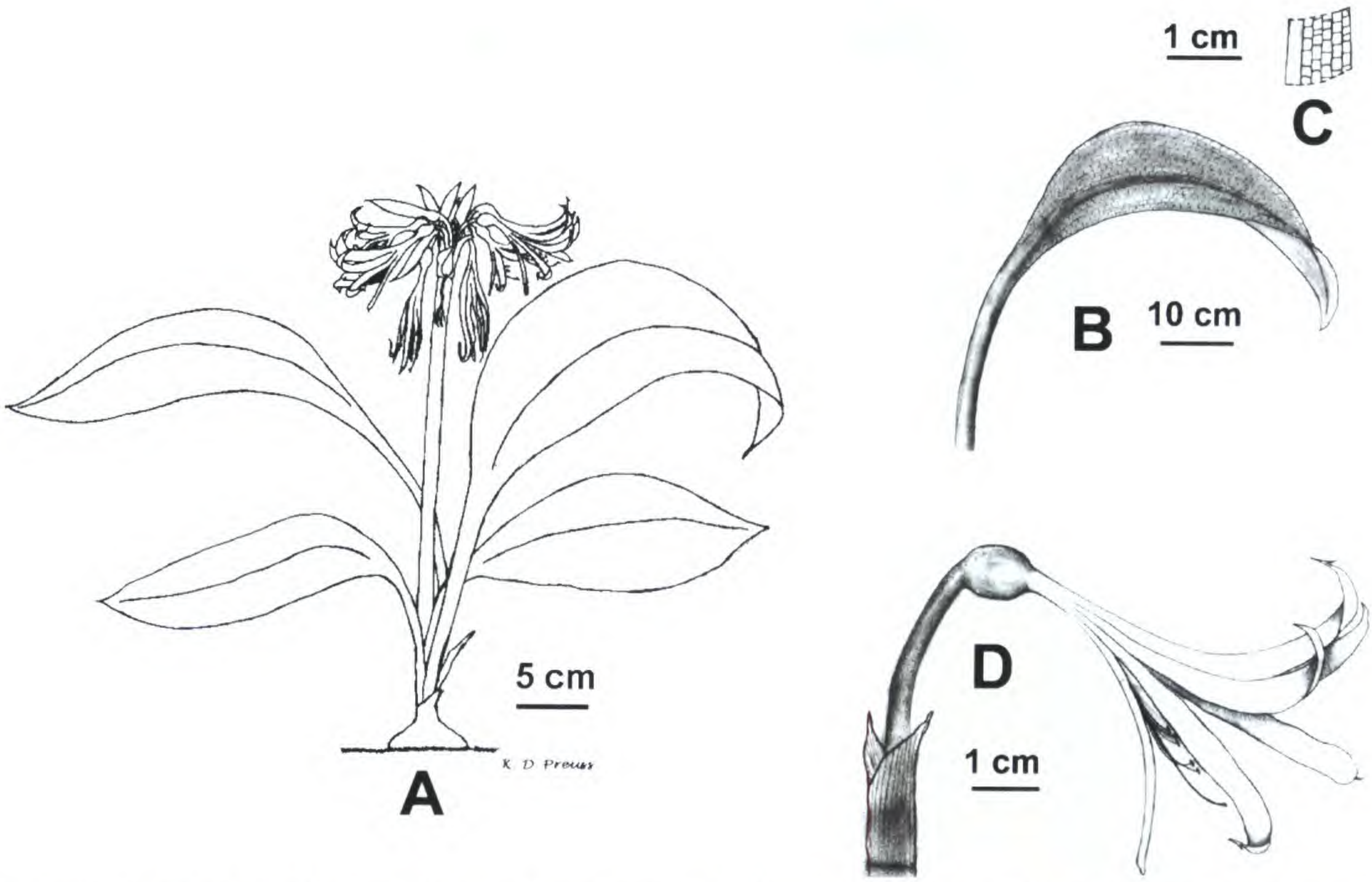

Figure 1. *Griffinia alba* Preuss & Meerow (*Pickel 2907*). —A. Reconstructed habit. —B. Single leaf. —C. Detail of adaxial surface showing commissural venation. —D. Flower.

cous abaxially. Inflorescence scapose (Fig. 1A); scape 35–38 cm tall, two-edged, solid, green, glabrous, terminating in a 16- to 17-flowered pseudoumbel (reduced helicoid cymes) enclosed by two partially fused ocreaceous, spathe bracts 2.3–2.5 cm long; pedicels 2.1–2.9 cm long, green. Perianth (Fig. 1D) zygomorphic; tepals 6 in two whorls, white, glabrous, fused into a perigonal tube ca. 1.3–1.5 cm long that is continuous with the ovary (thus forming a true hypanthium), arranged in a 5+1 manner with the upper 5 tepal segments reflexed and the lowermost descending, 4–5 cm long and 1–1.5 cm broad, narrowly obovate with acute apices, the outer whorl apiculate. Stamens 6 (5 declinate and 1 assurgent); filaments varying in length from 1.4 to 3.2 cm; anthers ca. 1 mm long, versatile, introrse, dehiscing longitudinally; pollen whitish. Style filiform, declinate, ca. 3.6–3.8 cm long; stigma truncate-punctate. Ovary semi-inferior, trilocular, ovoid to subglobose, ca. 5 mm diam.; ovules 2 to 6 per locule, axile but basally displaced, biseriate. Fruit and seed unknown.

During an investigation of the systematics of the genus *Griffinia* (Preuss, 1999), this new species was recognized from the type specimen (*Pickel 2907*, Fig. 2), which had been determined as *Griffinia intermedia* Lindley. However, *G. intermedia* is a considerably smaller, blue-flowered species; its exact provenance is unknown (it was shipped to England from the state of Rio de Janeiro). Traub and Moldenke (1949) considered it "intermediate" between *G. hyacinthina* Ker Gawler and *G. parviflora* Ker Gawler. *Griffinia alba* closely resembles *G. hyacinthina*, but differs from that species by its cuneate leaf base, which gradually tapers into the petiole, greater number of flowers (up to 17 compared to 8 to 10), longer pedicels, white vs. lilac-colored flowers, and more linear tepal segments. *Griffinia alba* is the first entirely white-flowered species described in subgenus *Griffinia*.

Griffinia alba is endemic to the gallery forests of northeastern Brazil and is known from a single locality in Tapera, Pernambuco. The Mata Atlântica formerly extended into the state of Pernambuco via dendritic passages, or gallery forests (Bucher, 1982), into the Caatinga Province (Oliveira-Filho & Ratter, 1995). Rizzini (1979) suggested that the galleries, in conjunction with the other hinterland forests, represent extensions of the Atlantic forest into the *cerrado* domain.

Since this new species is represented by just a single collection, we presume that it is rare or extirpated in its native habitat. Unfortunately, deforestation currently threatens the native habitats of

Figure 2. Holotype of *Griffinia alba* (*Pickel 2907*, US).

all *Griffinia* (Dean, 1995), and species of the genus are among the most endangered of South American geophytes (Walter & Gillet, 1998).

Acknowledgments. We thank US for the loan of the specimen and Kent D. Perkins of FLAS for assistance in processing the loan. This work was supported in part by NSF grant DEB-968787 to AWM and Charles L. Guy. Florida Agricultural Experiment Station Journal Series No. R-07146.

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A New Species of *Adenocalymma* Martius ex Meisner (Bignoniaceae) from Minas Gerais, Brazil

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ABSTRACT. A new species is presented for the genus *Adenocalymma* (Bignoniaceae tribe Bignonieae). *Adenocalymma magnoalatum* Scudeller occurs in the Parque Estadual do Rio Doce, Minas Gerais, Brazil. Its subcoriaceous blades and secondary veins raised and yellow below, a quadrangular ovary, and especially the 4-alate fruit and convex, bi-alate seeds compressed on the back distinguish the species.

RESUMEN. Se presenta una nueva especie para el género *Adenocalymma* (Bignoniaceae tribu Bignonieae), *A. magnoalatum* Scudeller, del "Parque Estadual do Rio Doce," Minas Gerais, Brasil. La especie se caracteriza por sus hojas subcoriáceas y venas secundarias elevadas y amarillas en el envés, un ovario cuadrangular y especialmente por el fruto 4-alado y las semillas convexas y bi-aladas comprimidas dorsalmente.

The etymology of *Adenocalymma* Martius ex Meisner is complex. The name is a compound of adenos (*αδενος* f. = glands) and calymma (*καλυμμα* n. = head-covering); these characteristics are found in almost all species of the genus. Meisner (1840) published the original description of the genus with the spelling *Adenocalymna*. However, Endlicher (1841) used the spelling *Adenocalymma*. As a result, two different spellings of this name still persist. Scudeller (2000) proposed the conservation of the *Adenocalymma* spelling, based both on what appears to be Meisner's own correction (1843), to the index of his original description, and Bureau (1872). Bureau pointed out that the original spelling used by Meisner (in his original description) was wrong and commented, "J'ai vu plus de dix étiquettes de la main de Martius, toutes rédigées conformément à l'étymologie grecque, et dans l'*Enchiridion* d'Endlicher, qui a paru en 1841, on trouve le même nom cité sous la forme correcte: ADENOCALYMMA" (Bureau, 1872: 19–20).

The genus *Adenocalymma* is represented by approximately 60 species (Mabberley, 1997). It is distributed in tropical America, from Mexico and the Lesser Antilles to Uruguay and northeast Argentina (Bureau & Schumann, 1896–1897; Sandwith & Hunt, 1974). It is characterized by branchlets terete, tendril simple, leaves entire, raceme axillary, bracts usually conspicuous but caducous, calyx with conspicuous black patelliform glands on the outer side, corolla tubular, bright yellow, either wholly tomentose or pubescent, very rarely wholly glabrous outside, 4 fertile stamens, 1 staminode, anther 2-divaricate, stigma 2-lamellate, and fruit capsule septifragal.

In this paper, a new species is presented from the Parque Estadual do Rio Doce, in the State of Minas Gerais, Brazil. The Parque Estadual do Rio Doce is located between 42°38′30″–48°28′18″W and 19°48′18″–19°29′24″S, encompassing the municipalities of Timóteo, Marliéria, and Dionísio, comprising an area of approximately 36,000 ha (Instituto Estadual de Florestas, 1994).

Adenocalymma magnoalatum Scudeller, sp. nov. TYPE: Brazil. Minas Gerais: Marliéria, Parque Estadual do Rio Doce (PERD), estrada do Restaurante, 10 Oct. 1996, *V. V. Scudeller 579* (holotype, VIC; isotype, MO (fr only)). Figure 1.

Haec species *A. paulistaro* Bureau & K. Schumann et *A. duseni* Kraenzlin affinis, sed ab eis calyce et corolla extus tomentosis, ovario 4-angulari, capsula oblonga, 4-alata glandulis pateliformibus in alis et seminibus alatis differt.

Liana. Branchlets elliptic to terete, lenticels abundant, without interpetiolar glandular fields; pseudostipules oblong-elliptic to linear, 0.7–1.0 × 0.1–0.3 cm, glabrous, with 1–3 patelliform glands at midpoint, persistent. Leaves opposite, brochidodromous, bifoliolate; tendrils simple; petioles 2.1–3.2 cm long, terete, with prominent lenticels; petiolules 2.6–4.1 cm long, terete; blades 11.4–17.0 × 4.5–7.7 cm, oblong-elliptic, chartaceous, glabrous above, densely lepidote below, base asymmetric, apex acuminate, margins revolute; primary veins straight, immersed above, prominent and yellowish below; secondary veins 8 to 10 pairs, moderate acute (angle of divergence = 55°), yellowish when dry. Inflorescence 5.95–14.27 cm long, 5–8 pairs of flowers, axillary racemiform, bracts and bracteoles 0.2–0.5 × 0.1–0.2 cm, linear, caducous,

without patelliform glands; calyx green, tubular, 5-denticulate, 0.9–1.1 × 0.6–0.8 cm, tomentose outside, patelliform glands toward apex, margins villose; corolla yellow, tubular-infundibuliform, with 5 lobes, mucronulate, symmetric, basal tube (ca. 1.2 cm) glabrous, toward apex tomentose outside, glabrate inside except lobes tomentose on both faces, corolla tube 4.2–5.4 × 1.5–1.9 cm, lobes 1.3–1.7 × 1.5–1.7 cm, mucronulate; stamens epipetalous, didynamous, included, longest pair 2.0–2.5 cm long, shortest pair 1.4–1.5 cm long, villose at the level of filament insertion, with capitate glandular trichomes, staminodes inconspicuous, anthers glabrous, 0.6–0.7 cm long, with thecae divergent, connective slightly prolonged, apiculate; ovary narrowly lanceolate, quadrangular, ca. 0.7 × 0.1 cm, glabrous, bilocular, ovules biseriate in each locule, style terete, ca. 3.6 cm long, stigma evenly 2-lamellate, with the lamellae oblong, 0.23 × 0.11 cm; nectar disc annular-pulvinate, ca. 0.2 × 0.1 cm. Capsule septifragal oblong, 4-alate, 21.7 × 4.9 cm, midribs prominent, patelliform glands abundant on the wings; seeds compressed on the back, convex, bi-alate, body 1.4–1.8 × 1.3 cm, wings hyaline-membranaceous, 1.6–1.7 × 1.3 cm each.

Distribution and habitat. *Adenocalymma magnoalatum* is known only from the type locality, Parque Estadual do Rio Doce, occurring in its Southwest area. This forest in the Parque Estadual do Rio Doce represents one of the last remnants of the Atlantic Rain Forest under legal protection in Minas Gerais. The species extends into the forest canopy.

The new species is related to the species group with linear pseudostipules, conspicuous glands in the calyx, subcoriaceous blades, and secondary veins raised and yellowish below. Similar species are *A. bracteatum* DC., *A. comosum* DC., *A. duseni*, *A. hatschbachii* A. H. Gentry (calyx eglandular), and *A. paulistarum*.

Adenocalymma magnoalatum is characterized by the mucronulate corolla lobes and quadrangular ovary, and is especially distinguished by the 4-alate fruit with well-developed veins and winged seeds.

Adenocalymma bracteatum is characterized by its tomentose calyx and bracts as long as buds, and it also occurs in the Parque Estadual do Rio Doce (Scudeller & Carvalho-Okano, 1998). This species is easily distinguished from the new species by shorter leaves (7.3–9.7 × 2.6–4.8 cm), ovary terete, and bracts concave. *Adenocalymma comosum* has the calyx glabrous. *Adenocalymma hatschbachii* differs from *A. magnoalatum* by the leaflets lanceolate, long acuminate and the calyx eglandular or with few inconspicuous glands. *Adenocalymma duseni* presents the petiolule longer than the petiole and leaflets ovate-lanceolate as in *A. hatschbachii*. Gentry (1993) distinguished the latter species by larger bracts and bracteoles, the usual presence of conspicuous calyx glands, thicker distinctly coriaceous leaves, and the corolla more infundibuliform-campanulate with included anthers.

In the absence of fruit, *A. magnoalatum* can be confused with *A. paulistarum* and *A. duseni*, with leaves with yellow veins when dry, bracts caducous, and corolla recurved. However, *A. magnoalatum* is distinguished from those by the petiolule usually longer than the petiole, the oblong-elliptic leaf blade with 8 to 10 pairs of secondary veins, and the quadrangular ovary.

The Parque Estadual do Rio Doce was visited monthly from September 1995 to February 1997 (Scudeller & Carvalho-Okano, 1998). *Adenocalymma magnoalatum* was found flowering only between January and March 1996, and in October 1996. It follows the phenological pattern *multiple bang* (see Gentry, 1974), with two or more flowering peaks annually. Despite this phenology, seed dispersal was only observed at the end of October, concomitant with one of the annual flowering peaks. According to Scudeller and Carvalho-Okano (1998), all other species of *Adenocalymma* flower at the same time (March and October), but only *A. bracteatum* can be mistaken for *A. magnoalatum* (see above).

As found in the literature, most *Adenocalymma* species occurring in Brazil and surrounding countries have a cylindrical or a slightly dorsiventrally flattened fruit. Only three species, *A. gracielzae* A. H. Gentry, *A. apurense* (HBK) Sandwith, and *A. purpurascens* Rusby, occurring in the north of Brazil and in Central America present a winged fruit.

Adenocalymma gracielzae differs from *A. magnoalatum* by the dorsal vein of the capsule being inconspicuous; the capsule having a puberulous and grooved surface; and the seeds being quadrangular but unwinged. Although *A. apurense* presents a slightly winged fruit, its seeds possess a larger seed body and narrow lines. In spite of the superficial similarity of the fruit, this new taxon differs from *A. purpurascens* by the shape of the leaves (ovate and very thick) and the bracts (as long as the buds and broadly ovate).

Paratypes. BRAZIL. **Minas Gerais:** Marliéria, Parque Estadual do Rio Doce, estrada da Campolina, 24 Jan. 1996 (fl), *V. V. Scudeller 187* (PERD, VIC), 24 Jan. 1996 (fl), *V. V. Scudeller 191* (RB, VIC); estrada do Restaurante, 25 Jan. 1996 (fl), *V. V. Scudeller et al. 217* (PERD, UEC, VIC), 12 Mar. 1996 (fl), *V. V. Scudeller 232* (PERD, VIC); estrada do Porto Capim, 10 Oct. 1996 (fr), *V. V. Scudeller 574* (RB, VIC); estrada do Restaurante, 15 Oct. 1996 (fl), *V. V. Scudeller 594* (MO, SPF, VIC).

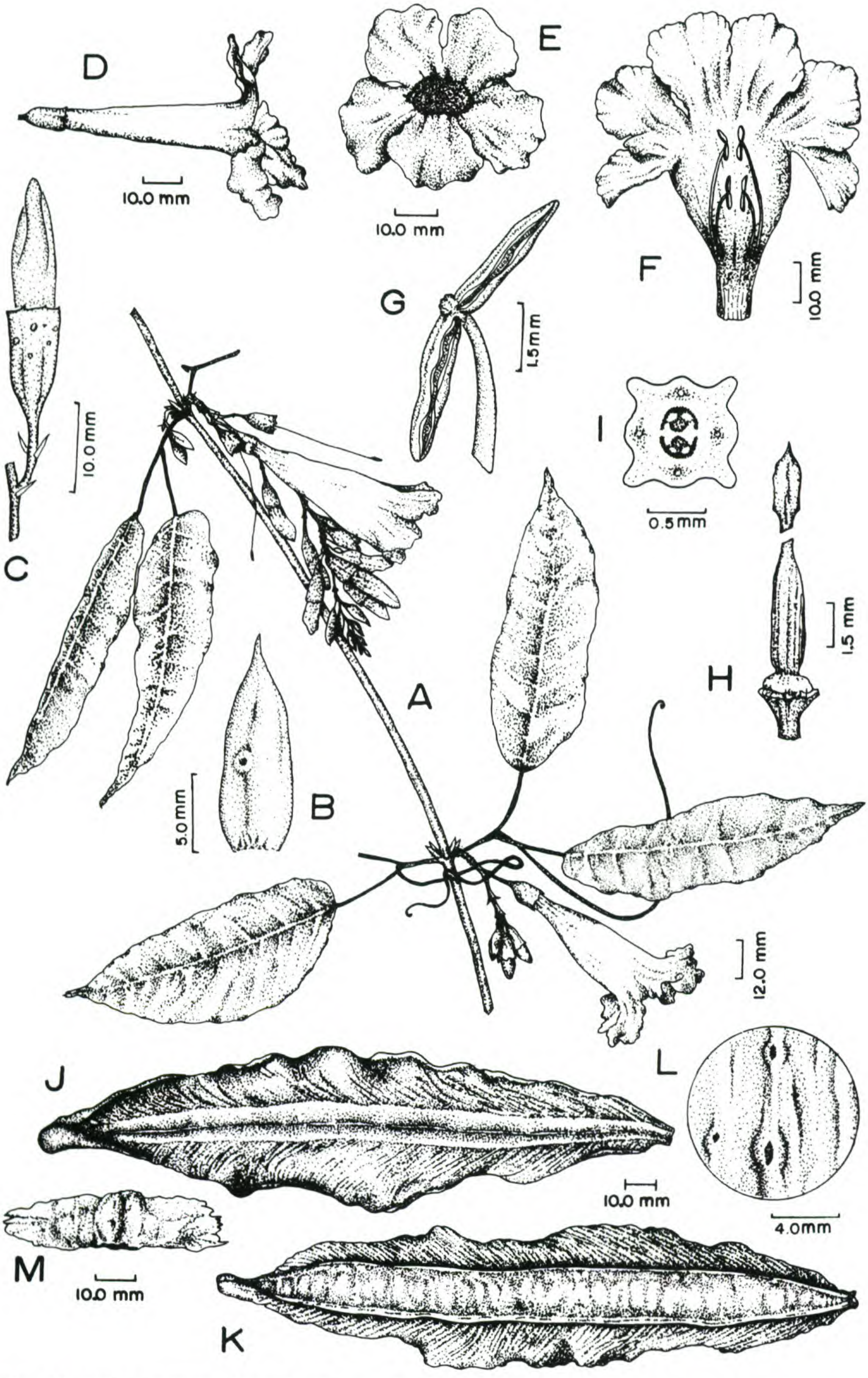

Figure 1. *Adenocalymma magnoalatum* Scudeller. —A. Flowering branch. —B. Pseudostipule with patelliform gland at midpoint. —C. Bud showing bracts and bracteoles inconspicuous and calyx with patelliform glands. —D. Lateral view of the flower. —E. Frontal view of the flower. —F. Longitudinal cross section through corolla, showing the

Acknowledgments. This article is part of a master's thesis in botany from the Depto. Biologia Vegetal–DBV/UFV, MG, Brazil. I am grateful to the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and to the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG—CBS grant no. 943/96) for financial aid during this study; to the curators of herbaria visited (BHCB, BM, CVRD, CJFP, HRCB, K, MO, RB, SPF, UEC, and VIC); to Lúcia Lohmann for assistance with references; to Tarciso S. Filgueiras and Marcos Aurelio Pereira for revision of the Latin description; to Reinaldo Antonio Pinto for preparing the line drawings, and, especially, to Rita Maria de Carvalho-Okano for her guidance advice throughout this study.

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←

epipetalous insertion of the stamens. —G. Details of the anther. —H. Gynoecium showing nectar disc, ovary, and stigma (style not shown). —I. Transversal cross section through ovary at midpoint. —J. Fruit, external view. —K. Fruit, internal view. —L. Detail of fruit wing showing patelliform glands. —M. Seed, showing two wings. (*V. V. Scudeller 579.*)

A New *Leptochloa* (Poaceae: Chloridoideae) from Papua New Guinea and the Torres Strait Islands of Australia

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ABSTRACT. *Leptochloa simoniana* N. Snow is newly described from Papua New Guinea and Boigu Island in the Torres Strait, Queensland, Australia. A key and tabular diagnosis are provided for *L. simoniana* and morphologically similar congeneric species. It most resembles the sub-Saharan species *L. coerulescens*. Its chief diagnostic features are the long-sericeous to arachnose hairs at the apex of the callus and the densely scabrous adaxial and abaxial leaf surfaces. The species is currently known from only three sites and is thus considered vulnerable.

RESUMEN. Se describe *Leptochloa simoniana* N. Snow, una especie nueva de Papúa Nueva Guinea y de la Isla Boigu en el Estrecho de Torres, Queensland, Australia. Se proporcionan una clave y una diagnosis tabular para *L. simoniana* y especies congenéricas morfológicamente similares. Es muy parecida a *L. coerulescens*, una especie del sub-Sahara. Se distingue principalmente por los tricomas largos a aracnoideos en la base de la lema. En actualidad la especie se conoce sólo de tres lugares y por lo tanto se la considera vulnerable.

The eragrostoid genus *Leptochloa* P. Beauvois occurs worldwide from temperate to tropical regions and consists of some 40 taxa (Snow, 1997a, 1998a). All widespread annual species are considered weedy in agricultural situations (Häfliger & Scholz, 1981; Snow, 1997a), and some are anthropogenically transcending oceanic boundaries and becoming established on continents far beyond their normal range (Lazarides, 1980; Snow & Simon, 1999). This article describes a new species brought to my attention by the collector of the type material, Barbara Waterhouse, and brings to three the number of newly described species in the genus since 1997 (Snow & Simon, 1997; Snow, 1998b).

Morphological attributes of herbarium material were measured and compared to known species of *Leptochloa* following Snow (1997a) under a phylogenetic species concept (Snow, 1997b). Descriptive terminology follows recommendations of the Systematics Association Committee (1962).

Leptochloa simoniana N. Snow, sp. nov. TYPE: Australia. Queensland: Cook District, Boigu Island, Torres Strait, 9°13.89′S, 142°13.26′E, 31 Mar. 1998, *B. M. Waterhouse & J. F. Grimshaw BMW 4862* (holotype, BRI; isotypes, BO, BRI, CANB, GREE, K, L, LAE, MEL, MO, NAQS, NSW, QRS). Figure 1.

Similis *Leptochloae caerulenti* autem paniculae ramis pluribus, pilis arachnoideis lemmatis basi, lemmatibus glumisque longioribus, vaginis dense scabris interdum pilos tuberculatos pilosos gerentibus, differt.

Plants annual, caespitose. Culms erect, sometimes branching, arising from fibrous roots, 90–140 cm tall, 2.5–4.0 mm wide at base, round to laterally compressed; nodes glabrous but often glaucous; internodes glabrous, 6–20 cm long, hollow. Leaf sheaths somewhat flattened near ground, longer or shorter than internodes, prickles short but dense throughout, tuberculate pilose hairs sometimes present, margins glabrous; collars green, lacking anthocyanin pigmentation. Ligules membranous, 3–4 mm long, apex truncate and erose. Leaf blades ± linear, 20–35 × 0.35–0.9 cm at base, densely scabrous throughout above and below, occasionally bearing a few tuberculate pilose hairs, flat but drying involute, remaining attached at base, midrib prominent above near base, less so elsewhere. Panicles narrow, inserted basally, exserted ca. 2/3 length or more, 45–75 × 2–10 cm; branches 65—75, alternate or sub-whorled, ascending to steeply ascending, 5–10 cm long near base decreasing to 5 mm or less near apex, rigid to slightly flexuous, densely scabrous throughout and highly striate, axils glabrous. Spikelets 3(4)-flowered, laterally compressed, 3.0–3.4 mm long, imbricate ca. 1/5–1/2 their length, pedicels 0.5–1.0(–2.0) mm long. Glumes membranous, 1-nerved, narrowly triangular to narrowly ovate; lower glume 1.6–2.1 mm long, apex attenuate, scabrous with prickles on midnerve and sometimes laterally; upper glume 1.8–2.4 mm long, apex acute to attenuate and sometimes shortly mucronate, scabrous with prickles on midnerve and laterally. Lemmas 3-nerved, membranous, (lowermost) 2.3–2.7 mm long, ovate, green, sometimes tinged maroon or crimson, lateral nerves neither prominent nor distinctly raised abaxially, hairs sericeous to arachnose at very base and callus apex (up to 1.3 mm long) but becoming relatively short sericeous (< 0.5 mm long) apically along nerves (sometimes sparsely so), sometimes shortly sericeous between nerves in lower third, hair tips tapered (Snow, 1996); apex acute or slightly emarginate and sometimes shortly mucronate. Palea thinly membranous, subequal to ca. 2/3 lemmatal length, narrowly elliptic to narrowly ovate, sericeous to arachnose along nerves; apex obtuse or

Table 1. Summary of character differences between *Leptochloa simoniana* and morphologically similar species in the genus. Character data from related species from Snow (1997a).

	L. simoniana	*L. coerulescens*	*L. chinensis*	*L. scabra*
Callus apex	long-sericeous to arachnose	glabrous	glabrous	glabrous
Leaf sheaths	scabrous with tuberculate pilose hairs	glabrous	glabrous or with a few pilose hairs near apex	glabrous to scabrous; margins glabrous
Leaf blades	densely scabrous above/below; occasionally with tuberculate pilose hairs	minutely but very densely scabrous above and below	glabrous to minutely scabrous	scabrous above and below
Ligule (mm)	3–4	1.2–2	1.8–5.4	(0.5–)1.5–2
Panicle branch number	65–75	(8–)27–47	25–60	50–150
Panicle branch stiffness	rigid to slightly flexuous	flexuous to arcuate	rigid to slightly flexuous	flexuous to arcuate
Florets	3(–4)	(2–)3–5	4–6	4–6
Lower glume (mm)	1.6–2.1	0.8–1.1	1.1–1.5(–1.7)	0.8–1.6
Upper glume (mm)	1.8–2.4	1.5–2.0	1.2–1.7	1.1–2.1
Lower lemma (mm)	2.3–2.7	1.6–2.2	1.2–1.7	2.1–2.4

with nerves slightly protruding. Lodicules 2, 0.3–0.4 mm, widely obovate, apex truncate. Stamens 3; anthers ca. 0.5–0.6 mm long, yellow. Caryopsis 1.2–1.3 × 0.6 mm, narrowly elliptic to narrowly ovate in hilar profile (Snow, 1998c), depressed ovate to oblate in trans-sectional profile, hilar groove absent, surface smooth, light brown; pericarp tightly adnate to endosperm.

Vernacular name. Simon sprangletop.

Leptochloa simoniana is currently known only from two collections near the southern coast of Papua New Guinea and two collections (including the type) from Boigu Island, Torres Strait, Australia. Two collections originated along footpaths and their connecting villages, whereas the two collections from Boigu Island were both taken from a refuse dump at the end of an airstrip. The species grows in seasonally inundated or disturbed sites such as footpaths, which is typical of other annual taxa in the genus (Snow, 1997a). Its preference for disturbed sites, along with the weedy tendencies of many annual taxa of *Leptochloa* (Snow, 1997a), suggests the species could also spread as a weed. *Leptochloa simoniana* also has been observed growing in brackish sites and adjacent mangrove vegetation (Waterhouse, pers. comm. 1998). Given the paucity of collections, the appropriate designation for *L. simoniana* is vulnerable (Criterion D; Species Survival Commission, 1994: 20).

The gross morphology of *Leptochloa simoniana* most resembles that of *L. coerulescens* Steudel, which is native to much of sub-Saharan Africa (Clayton, 1972; Philips, 1974; Koekemoer, 1991; Snow, 1997a). Features shared by both species include a narrow panicle, ascending habit of the panicle branches, dense prickles on the adaxial and abaxial leaf surfaces, and dense prickles on the sides of the upper glume. Two characters in particular help diagnose *Leptochloa simoniana* from related species. The first is the long-sericeous to arachnose hairs occurring on the upper portion of the callus. The second diagnostic feature is the dense distribution of prickles throughout both sheaths and blades of the leaves, upper glume, and occasionally lower glume (e.g., *Waterhouse 4121*). Diagnostic features of *Leptochloa simoniana*, *L. coerulescens*, *L. chinensis* (L.) Nees, and *L. scabra* Nees are summarized in Table 1, since the latter three generally resemble *L. simoniana.*

Although transoceanic arrivals into Australasia have been documented for several species of *Leptochloa* (e.g., Hitchcock, 1936; Lazarides, 1980; Nowack, 1994; Snow, 1997a; Snow & Simon, 1999), *L. coerulescens* has not been reported outside of Africa (Snow, 1997a). Specimens of the neotropical species *L. scabra* have been known from New Guinea for some time (Hitchcock, 1936) and these recently were confirmed (Nowack, 1994; Snow, 1997a), but this is far outside its normal range. I have seen (Snow, 1997a) the New Guinea specimens of Brass that Nowack (1994) suggested might be *L. scabra.* These specimens are as follows: *L. scabra* (*3725* pro parte; *6304a*); *L. virgata* (*3725* pro parte). Two other collections of Brass from New Guinea belonging to *L. scabra* are *1597* and *6043* (Snow, 1997a: 447).

The collectors note on the label of the type specimen insect predation on many florets, and speculate the larvae as being those of chrysomelid beetles (not verified). Mealy bugs also have

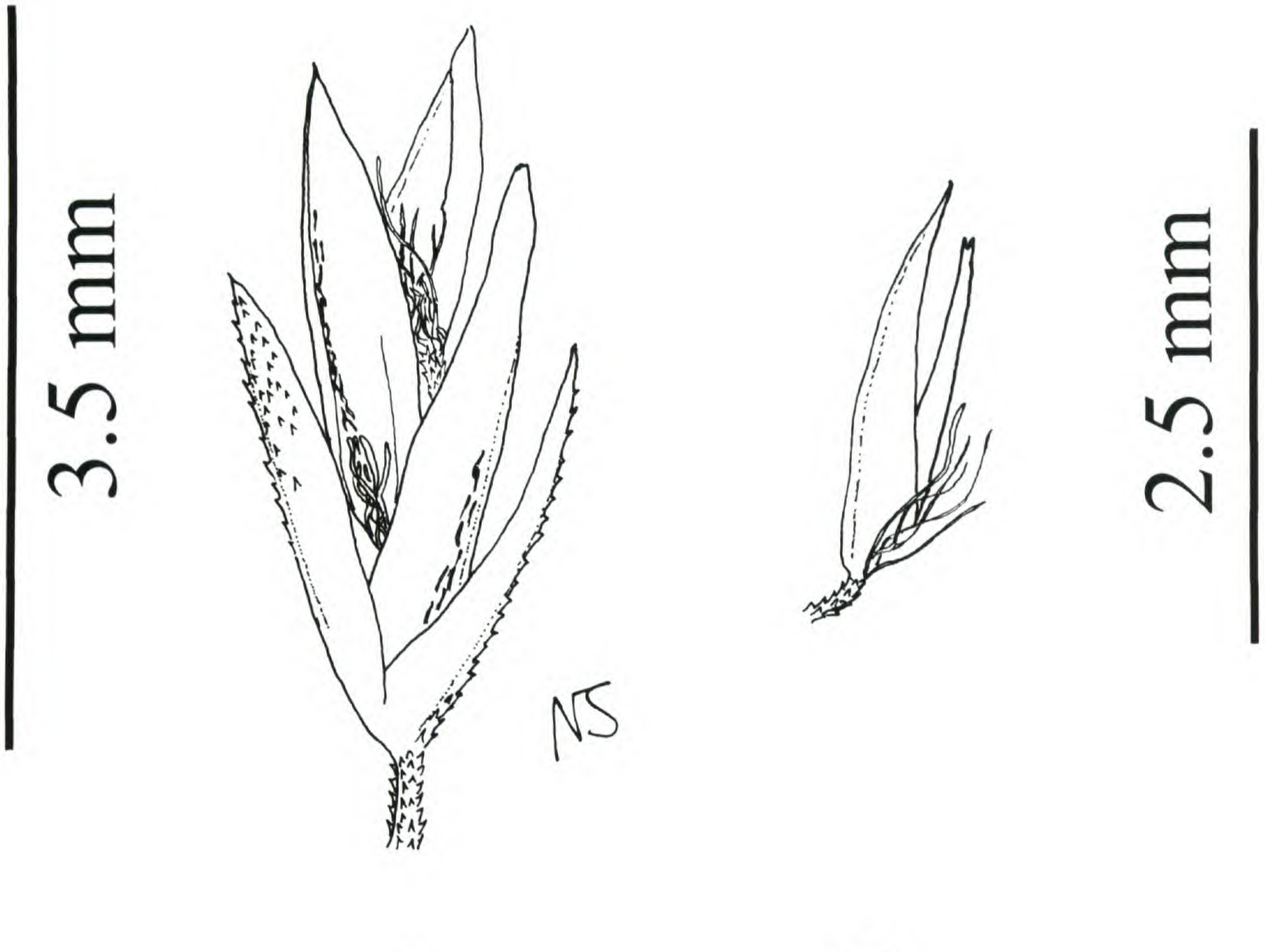

Figure 1. *Leptochloa simoniana* N. Snow (*Waterhouse 4108*). —A. Spikelet; arachnose hairs of callus evident in florets two and three. —B. Uppermost floret from different spikelet; lemma at left, palea at right, prickle-bearing rachilla, and arachnose hairs at apex of callus.

been observed on the base of culms, root crowns, and the abaxial surface of the ligules. The author would greatly appreciate viable seed of this species for further systematic studies of *Leptochloa*.

It is a pleasure to name this species after Bryan Simon, Senior Principal Botanist at the Queensland Herbarium, whose steady research output over three decades has greatly advanced our knowledge of the grass floras of Africa and Australia (e.g., Simon, 1971, 1972, 1992, 1993; Simon & Jacobs, 1999).

KEY TO *LEPTOCHLOA SIMONIANA* AND SIMILAR SPECIES

1. Callus bearing long-sericeous to arachnose hairs; Papua New Guinea and Torres Strait Islands of Australia ..... *L. simoniana*
1′. Callus glabrous; Asia, Africa, or New World, very rarely Australian 2
2. Panicle branches mostly rigid, not flexuous; rachilla often visible between uppermost florets; upper florets barely if at all imbricate; southern Asia and Africa, one collection from Mt. Isa, Queensland, Australia ..... *L. chinensis*
2′. Panicle branches ± flexuous; rachilla generally invisible between uppermost florets; upper florets somewhat imbricate 3
3. Leaf sheaths scabrous, glabrous on margins; second glume ± glabrous; lemma 2.1–2.4 mm long; panicle branches 50–150; southern North America to South America, introduced but apparently rare in New Guinea ..... *L. scabra*
3′. Leaf sheaths glabrous throughout; second glume with prickles on nerves and sides; lemma 1.6–2.2 mm long; panicle branches 27–47; sub-Saharan Africa ..... *L. coerulescens*

Paratypes. PAPUA NEW GUINEA. **Western Province**: Old Mawatta, 9°08.4′S, 142°56.9′E, 13 Feb. 1997, *B. M. Waterhouse BMW 4121* (BO, BRI, NAQS); Ture Ture, 9°06.5′S, 143°00.0′E, 13 Feb. 1997, *B. M. Waterhouse BMW 4108* (BRI). AUSTRALIA. **Boigu Island:** Torres Strait, rubbish dump, 9°14.6′S, 142°12.5′E, 20 Aug. 1999, *Waterhouse 5389* (BRI, CANB, MBA).

Acknowledgments. Thanks to B. Waterhouse and A. Holland for bringing these specimens to my attention; L. Pedley for the Latin diagnosis; C. Ulloa Ulloa for help with the Spanish abstract; S. Renvoize, J. Veldkamp, and V. Hollowell for reviewing the manuscript; and the Queensland Herbarium for providing research space and facilities.

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New and Interesting Milkweeds (Apocynaceae, Asclepiadoideae)

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ABSTRACT. Three Mesoamerican species of *Marsdenia* and four of *Matelea* are described as new and illustrated. New combinations are provided for a South American *Blepharodon*, a Mesoamerican *Cynanchum*, seven Mexican species of *Dictyanthus*, a species of *Gonolobus* from Mesoamerica and Ecuador, and one Mesoamerican and two Ecuadorian species of *Jobinia*. One species of *Marsdenia* and one of *Metastelma*, both from Mexico, are lectotypified, and the new name *Marsdenia purpusiana* W. D. Stevens is provided for *Ecliptostelma molle* Brandegee. The typification of *Matelea ampiyacuensis* Morillo is clarified, and the synonymy of *Metaplexis rostellata* Turczaninow is corrected.

In the course of ongoing studies of asclepiads, several new species, new combinations, and nomenclatural trivia have come to light and are presented here.

BLEPHARODON DECAISNE

Blepharodon pictum (Vahl) W. D. Stevens, comb. nov. Basionym: *Cynanchum pictum* Vahl, Eclog. Amer. 2: 24. 1798. TYPE: French Guiana. Cayenne: "Cajenna," *von Rohr s.n.* (holotype, C).

This long-overlooked name, the last unassigned Vahl name for a New World milkweed, clearly applies to the common South American species that has been generally treated as *Blepharodon nitidum* (Vellozo) J. F. Macbride. The original description is quite good, including the nitidous leaves, capillaceous pedicels longer than the peduncles, and the distally villose-canescent corolla lobes. The only other species of *Blepharodon* found in the general area of the type collection, *B. glaucescens* (Decaisne) Fontella, is quite different and a photograph of the type verifies this conclusion.

CYNANCHUM L.

Sundell (1981) divided *Cynanchum racemosum* (Jacquin) Jacquin into six more or less allopatric varieties. The coronas of *Cynanchum* subg. *Mellichampia* are disturbingly plastic, as well illustrated in Sundell's careful study, but generally do not have obvious geographic patterns. In this case, the coronal differences are obvious, as used exclusively in Sundell's key to the varieties, intermediate coronal conditions are not found, and there is a strong geographic pattern. Recent collections have only reinforced Sundell's distinctions. However, with the same information available, I prefer to recognize the varieties as species. These taxa correspond better to the species rank as accepted for other genera of Mesoamerican milkweeds. Furthermore, recognition of infraspecies of tropical milkweeds implies a better systematic understanding than I can justify.

For the five mainland varieties to be recognized at the rank of species, only the following new combination is required. It is peculiar that the Caribbean variety, *C. racemosum* var. *havanense* Sundell, apparently is still known from a single Sessé and Mociño collection (*s.n.*, K) from Havana, Cuba. Species of *Cynanchum* subg. *Mellichampia* tend to occupy weedy habitats and are generally well represented in herbaria; one could speculate that this single Cuban specimen might be a mainland collection somehow mislabeled in the peregrinations of the Sessé and Mociño materials.

Cynanchum cyathiforme (Sundell) W. D. Stevens, comb. et stat. nov. Basionym: *Cynanchum racemosum* var. *cyathiforme* Sundell, Evol. Monogr. 5: 51. 1981. TYPE: Guatemala. Santa Rosa: Cuajiniquilapa, 900 m, *Heyde & Lux ex Smith 6187* (holotype, US; isotypes, M, NY, US, VT).

DICTYANTHUS DECAISNE

Stevens (1989) reviewed the species of *Matelea* subg. *Dictyanthus*, excluding three species somewhat intermediate with the larger concept of *Matelea*. Further studies of the generic limits of *Matelea* and related genera now support the recognition of *Dictyanthus* at the generic level, including the three species previously excluded. *Dictyanthus* can be distinguished from related genera by having at least some of the trichomes uncinate, the glandular trichomes translucent, a digitately five-lobed corona whose axes are at least partly adnate to the corolla, and follicles with asymmetrical

bases and sparse, curved, conical prickles. While most of the species have names available in *Dictyanthus*, the following require new combinations.

Dictyanthus altatensis (Brandegee) W. D. Stevens, comb. nov. Basionym: *Gonolobus altatensis* Brandegee, Zoe 5: 244. 1908. TYPE: Mexico. Sinaloa: vicinity of Culiacán, Yerba Buena, 10 Sep. 1904, *Brandegee s.n.* (holotype, UC).

Dictyanthus eximius (W. D. Stevens) W. D. Stevens, comb. nov. Basionym: *Matelea eximia* W. D. Stevens, Ann. Missouri Bot. Gard. 75: 1552. 1988 [1989]. TYPE: Mexico. Chiapas: Finca Unión Juárez, 12 Aug. 1937, *Matuda 1778* (holotype, MICH; isotype, MEXU).

Dictyanthus hamatus (W. D. Stevens) W. D. Stevens, comb. nov. Basionym: *Matelea hamata* W. D. Stevens, Ann. Missouri Bot. Gard. 75: 1540. 1988 [1989]. TYPE: Mexico. Guerrero: La Unión, 50 m, 29 July 1898, *Langlassé 257* (holotype, US; isotypes, GH, P).

Dictyanthus lautus (W. D. Stevens) W. D. Stevens, comb. nov. Basionym: *Matelea lauta* W. D. Stevens, Ann. Missouri Bot. Gard. 75: 1548. 1988 [1989]. TYPE: Mexico. Colima: gorge of Río Cihuatlán, 13 mi. N of Santiago, 200–300 m, 27 July 1957, *McVaugh 15826* (holotype, MICH).

Dictyanthus macvaughianus (W. D. Stevens) W. D. Stevens, comb. nov. Basionym: *Matelea macvaughiana* W. D. Stevens, Ann. Missouri Bot. Gard. 75: 1545. 1988 [1989]. TYPE: Mexico. Jalisco: near Guadalajara, 5 Aug. 1902, *Pringle 8629* (holotype, MSC; isotypes, ENCB, F, G, GH, L, MEXU, MO, NY, P, PH, POM, UC, US, VT, W).

Dictyanthus sepicola (W. D. Stevens) W. D. Stevens, comb. nov. Basionym: *Matelea sepicola* W. D. Stevens, Phytologia 32: 387. 1975. TYPE: Mexico. Jalisco: ca. 6.9 mi. SW of Hwy. 15 along road to Ameca, 23 Aug. 1971, *Stevens 1436* (holotype, MSC; isotypes, ENCB, F, MO).

Dictyanthus suffruticosus (W. D. Stevens) W. D. Stevens, comb. nov. Basionym: *Matelea suffruticosa* W. D. Stevens, Ann. Missouri Bot. Gard. 75: 1558. 1988 [1989]. TYPE: Mexico. Oaxaca: 4 mi. W of junction of Mex. 185 with Mex. 190, near La Ventosa, 17 Aug. 1971, *Wunderlin, Dwyer, Spellman & Vaughn 800* (holotype, MO; isotype, MEXU).

Gonolobus Michaux

Gonolobus fimbriatiflorus has a long, tubular faucal annulus enclosing the stipitate gynostegium. "Faucal annulus," as here used, corresponds to Woodson's (1941) terminology and is the same as Kunze's (1995) "annular corona." The homologies of the coronal structures of gonoloboid milkweeds are not well understood, but I use the term faucal annulus for the outermost structure on the corolla limb, annular in form and generally with the color, texture, and indumentum of the adjacent corolla. The more obviously staminal elements of the corona, when present, are immediately within the faucal annulus. Some species of *Gonolobus* having a tubular faucal annulus, such as *G. lasiostemma* (Hemsley) Woodson from Mesoamerica, either lack or have a vestigial staminal corona, which would be entirely included within the annulus tube if present, and the anther appendages typical of *Gonolobus* are also vestigial. In the original publication of *Matelea fimbriatiflora*, the annulus was described as the (staminal) corona, leading to the generic misplacement. Recent collections of this species from Panama and Costa Rica have large follicles with 5 broad wings, typical of *Gonolobus*.

Gonolobus fimbriatiflorus (Morillo) W. D. Stevens, comb. nov. Basionym: *Matelea fimbriatiflora* Morillo, Ernstia 29: 2. 1985. TYPE: Ecuador. Pichincha: 20 km W of Santo Domingo de los Colorados, 1000 ft., 18 Oct. 1961, *Cazalet & Pennington 5061* (holotype, US; isotypes, BM, F, K, NY).

Jobinia E. Fournier

Fontella and Schwarz (1982) recognized six species of *Jobinia*, five in Brazil and one in the Andes. The most conspicuous characters of the genus are the paired, axillary, diffusely paniculiform inflorescences of small (mostly 2–3 mm long) flowers, thickened nodes with prominent interpetiolar ridges, fleshy leaves with inconspicuous secondary venation, and a lobed, cupulate corona. In these six species, the gynostegium varies from sessile to stipitate and the corona from free of the gynostegium to tightly appressed to the gynostegium stipe. *Jobinia paranaensis* Fontella & C. Valente, in particular, has the connate part of the corona adherent to the gynostegium stipe and the five free lobes diverging from the top of the stipe. Continuing this trend toward adhesion of the corona to the stipe only slightly, the corona superficially appears to be comprised of five free lobes on the gynostegium stipe, the normal condition of *Metastelma*. The fol-

lowing three species are in this category, having been misplaced in *Metastelma* and *Cynanchum*. Although this significantly expands the geographic range of *Jobinia*, it does not require any significant change in the generic concept. In fact, the paired, axillary, diffusely paniculiform inflorescences and general appearance of the plants fit well in *Jobinia* and are anomalous in either *Metastelma* or *Cynanchum* with their solitary, extra-axillary, umbelliform to racemiform inflorescences. *Jobinia eulaxiflora* is now known from several collections from central Mexico to Honduras, while the other two additional species are still known only from Ecuador.

Jobinia balslevii (Morillo) W. D. Stevens, comb. nov. Basionym: *Cynanchum balslevii* Morillo, Ernstia n.s. 2: 60. 1992. TYPE: Ecuador. Napo: Baeza–Tena road, 8 km from Baeza, 77°50′W, 0°31′S, 1800–1900 m, 28 Oct. 1976, *Balslev & Madsen 10415* (holotype, AAU; isotype, MO).

Jobinia campii (Morillo) W. D. Stevens, comb. nov. Basionym: *Cynanchum campii* Morillo, Ernstia n.s. 2: 60. 1992. TYPE: Ecuador. Azuay: 1–8 km N of Sevilla de Oro, 8000–9000 ft., 27 July–12 Aug. 1945, *Camp E-4401* (holotype, NY; isotypes, K, MO).

Jobinia eulaxiflora (Lundell) W. D. Stevens, comb. nov. Basionym: *Cynanchum eulaxiflorum* Lundell, Wrightia 5: 351. 1977. *Metastelma eulaxiflorum* (Lundell) Liede, Novon 7: 41. 1997. TYPE: Guatemala. Baja Verapaz: Union Barrios, E of Km 154, 8 June 1975, *Lundell & Contreras 19401* (holotype, LL; isotype, MO).

Marsdenia R. Brown

Marsdenia gilgiana W. Rothe was described with three syntypes: *Purpus 2095*, *Heyde & Lux 4542*, and *Bernoulli & Cario 1865*. The Purpus collection differs significantly from Rothe's key characters for the species, particularly in having the calyx lobes shorter than the corolla tube, rather than distinctly longer, and in having the corona lobes inconspicuous and apically attenuate, rather than well developed and dilated above, and clearly represents a different species than the other two syntypes. *Ecliptostelma molle* Brandegee was based on *Purpus 7662*, collected from the same locality as *Purpus 2095*, and both collections clearly belong to the same species, although Brandegee considered the corona to be absent rather than merely inconspicuous. To resolve these problems, *Marsdenia gilgiana* needs to be lectotypified with a syntype that does match the original description, and *Ecliptostelma molle* needs to be renamed in *Marsdenia*. *Heyde & Lux 4542* is chosen as the lectotype because it matches the original description in all details, and Heyde and Lux specimens are better represented in American herbaria.

Marsdenia gilgiana W. Rothe, Bot. Jahrb. Syst. 53: 410. 1915. TYPE: Guatemala. Santa Rosa: Casillas, 4000 ft., May 1893, *Heyde & Lux ex Smith 4542* (lectotype, selected here, MO; isolectotype, B probably not extant).

Marsdenia purpusiana W. D. Stevens, nom. nov. Based on *Ecliptostelma molle* Brandegee, Univ. Calif. Publ. Bot. 6: 371. 1917, not *M. mollis* Schlechter. TYPE: Mexico. Veracruz: Zacuapan, 1916, *Purpus 7662* (holotype, UC; isotype, MO).

Marsdenia nicaraguensis W. D. Stevens, sp. nov. TYPE: Nicaragua. Matagalpa: ridge between Cerro Bravo and Cerro Picacho, N of Hotel Selva Negra, 13°01′N, 85°54–55′W, 1490–1550 m, 26 May 1985, *Davidse, Grijalva & Sousa 30465* (holotype, MO). Figure 1.

Species affinis *Marsdeniae stephanotidifoliae*, a qua calyce pubescenti apice styli breviore differt.

Twining vine, lower stems and underground parts unknown, stems glabrous or minutely puberulent when young, lenticellate; sap white. Leaves opposite, blades 16–18.5 × 8.7–13.2 cm, elliptic or barely ovate, apex caudate or acuminate, base obtuse, rounded, truncate or shallowly lobate, glabrous, fleshy, lateral veins 4 to 6 pairs, middle veins 45–55° to midrib, colleters 4 to 16; petiole 4.2–7.2 cm long, glabrous. Inflorescence 1 per node, paniculiform, often bifurcate at base or above and then with 2 to 4 congested-racemiform branches, appressed-puberulent, peduncle 3–25 mm long, pedicel 3.5–5 mm long, often curved, bracts 2–2.5 mm long, 0.4–0.7 mm wide, lanceolate; calyx with 2 colleters below each sinus within, lobes ovate with rounded tips, 2.8–3.2 × 1.8–2.9 mm, adaxially glabrous, abaxially appressed-puberulent, margin inconspicuously ciliolate; corolla urceolate, without thickenings in sinuses, adaxially villose in mouth and along center of lobes, retrorse-barbate in upper half of tube along a line below each lobe, abaxially glabrous, yellowish green with a pink tint on tube, tube 3.5–4.2 mm long, lobes elliptic, tip rounded and notched, 2.3–2.9 × 1.7–2.3 mm, inconspicuously ciliolate; corona apparently green, lobes broadly sagittate, lateral margins somewhat

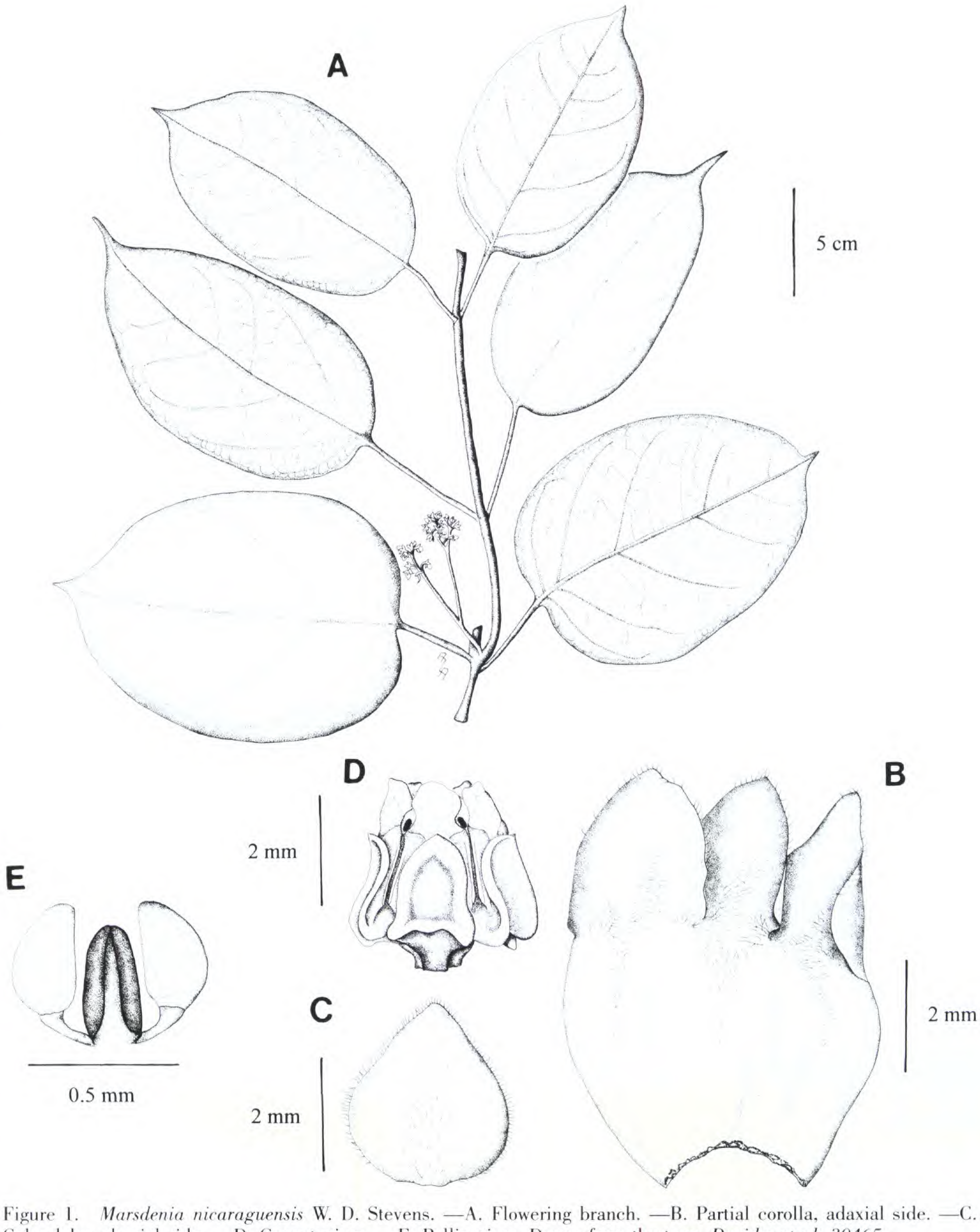

Figure 1. *Marsdenia nicaraguensis* W. D. Stevens. —A. Flowering branch. —B. Partial corolla, adaxial side. —C. Calyx lobe, abaxial side. —D. Gynostegium. —E. Pollinarium. Drawn from the type, *Davidse et al. 30465*.

thickened and revolute below, 1.6–1.8 mm long, 1.4–1.7 mm wide at base; stipe 0.2–0.3 mm long, anther wings ca. 1.3 mm long; corpusculum ellipsoid, ca. 0.38 mm long, ca. 0.18 mm wide, translator ca. 0.15 mm long, pollinia ellipsoid, ca. 0.45 mm long, ca. 0.2 mm wide; style apex convex and minutely apiculate, ca. 1.2 mm wide. Follicles and seeds unknown.

This species seems to be closest to *Marsdenia stephanotidifolia* Woodson from Guatemala, with which it shares large fleshy leaves, urceolate corollas, and fleshy corona lobes with reflexed mar-

gins. *Marsdenia nicaraguensis* is clearly different from that species in having smaller flowers, calyx lobes abaxially pubescent, corolla lobes shorter than the corolla tube, and a short style apex not exceeding the anthers. It shares fleshy leaves, bifurcating inflorescences, and the general pattern of indumentum within the corolla with *M. steyermarkii* Woodson, also from Guatemala, but that species has long, thin corona lobes much exceeding the style apex.

Paratypes. NICARAGUA. **Jinotega:** Macizos de Peñas Blancas, 13°16–17′N, 85°40–41′W, 1350–1650 m, 14 Jan. 1979, *Stevens 11320* (MO). **Matagalpa:** Cerro El Picacho, 13°00′N, 85°55′W, 1420 m, 5 Jan. 1984, *Gentry et al. 44050* (MO); NW slope of Cerro El Picacho, 13°00′N, 85°55′W, 1420–1520 m, 25 May 1983, *Stevens 22121* (MO).

Marsdenia olgamarthae W. D. Stevens, sp. nov. TYPE: Nicaragua. Estelí: Cerro Quiabú, just below summit, 13°06′N, 86°25′W, 1550–1600 m, 27 Apr. 1980, *Stevens & Montiel 16906* (holotype, MO). Figure 2.

Habitu *Marsdeniae steyermarkii* subsimilis, a qua lobis coronae brevioribus lobis corollae tubo corollae breviora recedit. Species uxori carissimae Olga Martha Montiel, qua mecum plantas ejusdem speciem collectavit, nominavi.

Twining woody vine, lower stems and underground parts unknown, stems glabrous, lenticellate; sap white. Leaves opposite, blades 7.5–10.8 × 3.4–6.6 cm, elliptic, apex acuminate, base obtuse, rounded or truncate, glabrous, lateral veins 7 to 9 pairs, middle veins 50–55° to midrib, colleters 8 to 10; petiole 1.8–2.5 cm long, glabrous. Inflorescence 1 per node, paniculiform, often bifurcate at base or above and then with 2 to 4 racemiform branches, appressed-puberulent, peduncle 0–12 mm long, pedicel 2.8–4 mm long, bracts 0.7–1.6 × 0.9–1.1 mm, deltate; calyx with 1 to 3 colleters below each sinus within, lobes ovate with rounded tips, 2.1–2.5 × 1.8–2.4 mm, adaxially glabrous, abaxially sparsely appressed-puberulent, margin inconspicuously ciliolate; corolla campanulate, without thickenings in sinuses, adaxially villose in mouth and along center of lobes, abaxially glabrous, cream to yellow, tube 2.2–2.3 mm long, lobes elliptic, tip rounded and notched, 3.3–3.8 × 1.7–2.4 mm; corona lobes broadly deltate, 1.3–1.6 mm long, 1–1.2 mm wide at base; gynostegium sessile, anther wings 0.7–0.9 mm long; corpusculum ellipsoid, 0.3–0.33 × 0.1–0.13 mm, translator ca. 0.1 mm long, pollinia ellipsoid, 0.27–0.33 × 0.12–0.28 mm; style apex attenuate, 1.6–1.9 mm long, 1.2–1.4 mm wide at base. Follicle fusiform with acute tip, 10–11 × 2–2.3 cm, glabrous; seeds obovate, 14–15 × 6–7.5 mm, yellow-brown, margin 0.5–0.7 mm wide, entire, surface smooth, coma 2–4 cm long, white or slightly tawny.

This species has the general appearance of *Marsdenia steyermarkii* Woodson, with which it shares relatively narrower and fleshier leaves than related species, bifurcating inflorescences, and a campanulate corolla with the same general pattern of indumentum of the corolla; it differs from that species in having shorter corona lobes and corolla lobes longer than the tube. *Marsdenia stephanotidifolia* and *M. nicaraguensis* are distinguished by their urceolate corollas and broader leaves.

Paratypes. NICARAGUA. **Estelí:** El Quiabú, 10 km NW de Estelí, 13°06′N, 86°25′W, 1600 m, 31 Mar. 1983, *Moreno 21182* (MO). **Matagalpa:** Cerro Santa María, 3 km SE de Esquipulas, 12°38′N, 85°46′W, 1200 m, 25 Jan. 1985, *Moreno 25388* (MO).

Marsdenia veronicae W. D. Stevens, sp. nov. TYPE: Nicaragua. León: slope and ridge immediately W of Quebrada Las Ruedas, NW of El Transito, 12°05′N, 86°43′W, 15–30 m, 13 May 1981, *Stevens, Moreno & Henrich 20152* (holotype, MO). Figure 3.

Species forte *Marsdeniae macrophyllae* affinis, at foliis crassioribus coriaceis et floribus albis albidisve recedens. Species botanicae Verónica Juárez Jaimes, *Marsdeniae* studiosae, grate nominavi.

Twining woody vine, lower stems with brown, corky bark, underground parts unknown, stems tomentulose, glabrescent, lenticellate; sap white. Leaves opposite, blades 9.6–16(20) × 4.1–10(15) cm, elliptic, apex acuminate to attenuate, base obtuse to rounded, mostly abruptly and inconspicuously cordate at attachment of petiole, rarely conspicuously lobate, glabrous or sparsely tomentulose at base above, glabrous to densely tomentulose below, lateral veins 4 to 7 pairs, middle veins 50–70° to midrib, colleters 4 to 12; petiole 0.9–2.2 cm long, glabrous to tomentulose. Inflorescence 1 per node, congested-paniculiform, nearly umbelliform, tomentulose, peduncle 0–3.5 mm long, pedicel 3.5–5.5 mm long, bracts 2–3 × 1–1.5 mm, deltate; calyx with 1 to 2 colleters below each sinus within, lobes elliptic with rounded tips, cucullate, 4.3–5.2 × 3.4–4.7 mm, adaxially glabrous, abaxially tomentulose, margin ciliolate; corolla tubular to narrowly campanulate, without thickenings in sinuses, adaxially retrorse-barbate in a small patch at base of tube below each lobe, abaxially glabrous, white to greenish yellow, tube 4.2–4.8 mm long, lobes elliptic, tip rounded and notched, 5.5–6.8 × 3.4–

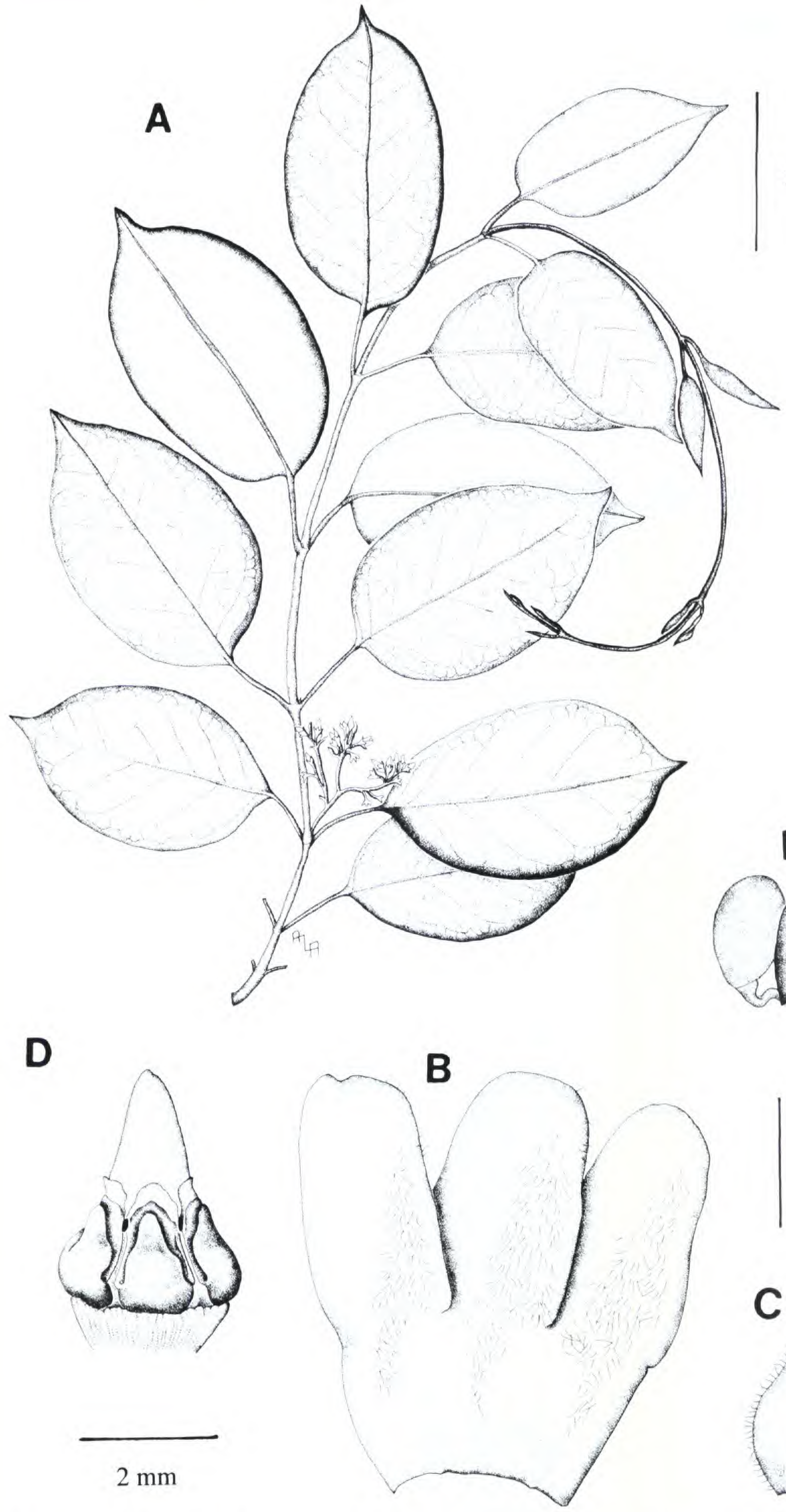

Figure 2. *Marsdenia olgamarthae* W. D. Stevens. —A. Flowering branch. —B. Partial corolla, adaxial side. —C. Calyx lobe, abaxial side. —D. Gynostegium. —E. Pollinarium. —F. Follicle. A–E drawn from the type, *Stevens & Montiel 16906*, F drawn from *Moreno 25388*.

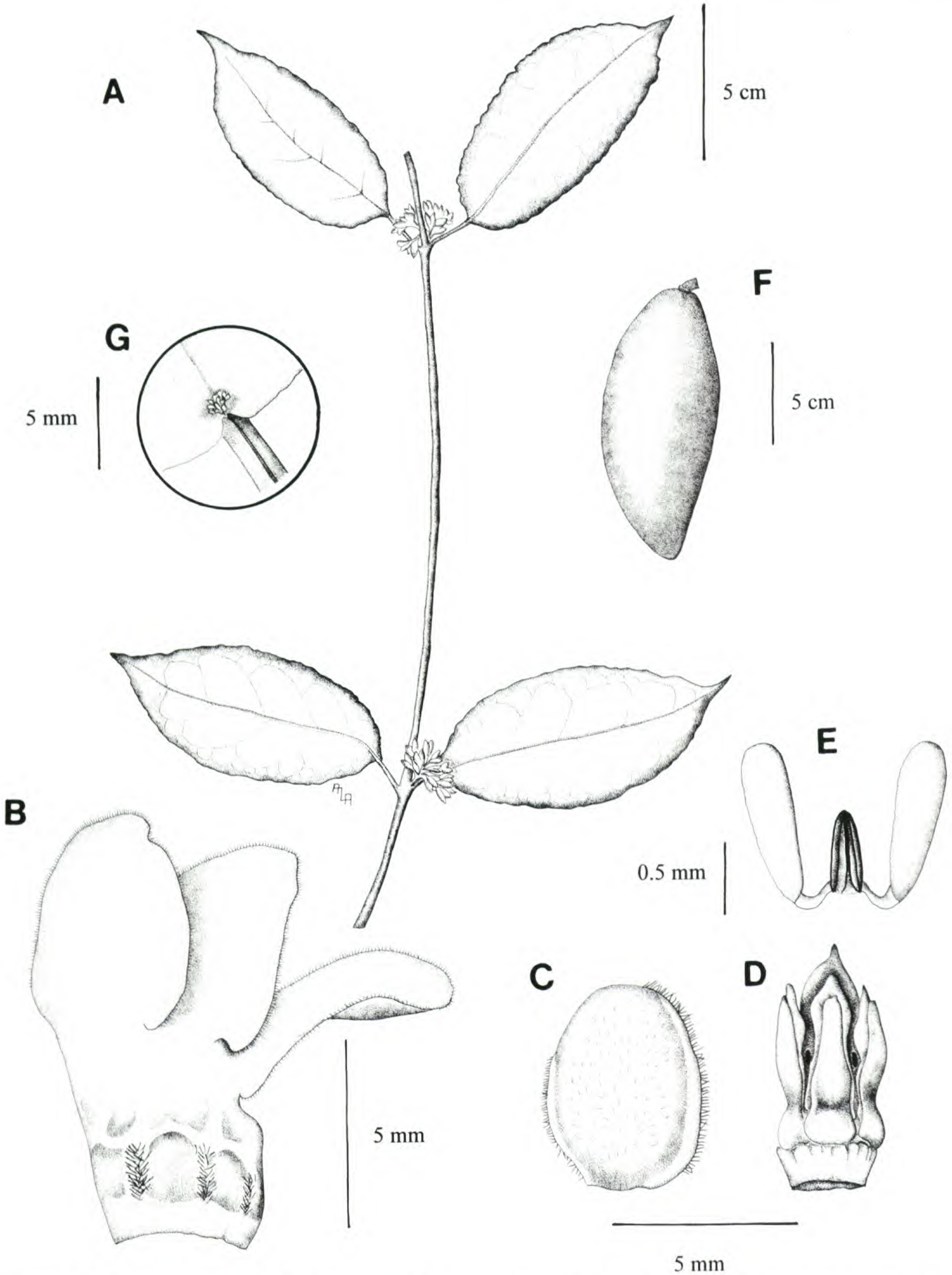

Figure 3. *Marsdenia veronicae* W. D. Stevens. —A. Flowering branch. —B. Partial corolla, adaxial side. —C. Calyx lobe, abaxial side. —D. Gynostegium. —E. Pollinarium. —F. Follicle. —G. Leaf base, adaxial side. A–E drawn from the type, *Stevens, Moreno & Henrich 20152*, F, G drawn from *Stevens 23074*.

4.6 mm; corona lobes lanceolate, inconspicuously to conspicuously truncate and dentate at tip, 3–3.8 mm long, 0.9–1.3 mm wide at base; gynostegium sessile, anther wings 1.2–1.4 mm long; corpusculum ellipsoid-subsagittate, 0.62–0.68 × 0.17–0.23 mm, translator 0.25–0.28 mm long, pollinia narrowly obovate, 1.07–1.15 × 0.3–0.35 mm; style apex conical, apiculate, 1.5–2.2 mm long, 1.2–1.6 mm wide at base. Follicle ellipsoid, slightly asymmetrical, blunt at both ends, 11–14 × 4–5.5 cm, glabrous; seeds obovate, 9.2–10 × 5.5–6.3 mm, olive-green to tan, margin 0.5–0.6 mm wide, entire to slightly crenulate distally, surface smooth, coma 3.5–5.5 cm long, white to tawny.

This new species constitutes part of what has been considered *Marsdenia macrophylla* (Humboldt & Bonpland ex Schultes) E. Fournier. As understood here, *M. macrophylla* ranges from Panama through most of South America, while *M. veronicae* ranges from northwestern Costa Rica into Mexico. *Marsdenia veronicae* has smaller, more coriaceous leaves with corneous margins, which frequently become undulate on drying and have bases that are usually rounded or obtuse and only cryptically cordate at the very base. Furthermore, *M. macrophylla* has red to red-brown flowers, while those of *M. veronicae* are white to yellow-green. *Marsdenia schlechteriana* W. Rothe shares with these two species a tendency for the corona lobes to have ragged rather than simply acute apices, but this is a high-elevation species ranging from southern Mexico to El Salvador that blackens on drying. *Marsdenia veronicae* is somewhat more distantly related to *M. engleriana* W. Rothe, a high-elevation species endemic to northwestern Costa Rica with corolla lobes less than 5 mm long and leaves that dry blackish and are pannose below, *M. nicoyana Pittier*, a low-elevation species from northwestern Costa Rica and the Pacific slope of Nicaragua with corolla lobes less than 5 mm long and leaves that are not cryptically cordate at the base, and *M. propinqua* Hemsley, a southeastern Mexican species with corolla lobes less than 5 mm long and leaves that are pannose below.

Paratypes. COSTA RICA. **Guanacaste:** Bagaces, P.N. Palo Verde, Valle del Tempisque, Cerro Coyotál, 10°21′10″N, 85°13′00″W, 10–100 m, 23 May 1994, *Chavarría 956* (CR, INB, MO); P.N. Palo Verde, Valle del Tempisque, Sector Los Negritos, 10°21′10″N, 85°13′00″W, 10–100 m, 11 Feb. 1995, *Chavarría 1222* (INB, MO); La Cruz, P.N. Santa Rosa, Península de Santa Elena, Estación Murciélago, Bahía El Hachal, 10°54′10″N, 85°43′50″W, 20 Aug. 1994, *Quesada 142* (CR, INB, MO); Liberia, P.N. Santa Rosa, Sendero Carbonal, 10°43′N, 85°40′W, 100 m, 17 July 1992, *Fernández 299* (CR, INB, MO); P.N. Santa Rosa, 30 km NW of Liberia, 10°50′N, 85°35′W, 0–320 m, 17 Mar. 1984, *Janzen 12381* (MO). EL SALVADOR. **La Libertad:** San Diego, 13°29′N, 89°18′W, 11 May 1995, *Villacorta & Montalvo 2285* (B, LAGU, MO). **Santa Ana:** Metapán, Montaña San Diego, 6 km S de Metapán, 14°16′20″N, 89°27′40″W, 500 m, 28 Apr. 1995, *Linares & Martínez 2725* (MO). NICARAGUA. **Boaco:** 3 km W of Hwy. 7 on road to Camoapa, 12°19′N, 85°36′W, 320 m, 4 Aug. 1984, *Stevens 22984* (MO). **Carazo:** Mpio. Diriamba, Buenavista de Apompua, 13 km SW de Diriamba, 11°45′N, 86°18′W, 70 m, 10 July 1984, *Moreno 24312* (MO); 3.3 km SE of Casares on road to Huehuete, SE of La Bocana Grande, 11°38′N, 86°21′W, 0–50 m, 10 July 1977, *Stevens 2745* (MO). **Chontales:** 10 km de Camoapa, La Unión, 12°19′N, 85°35′W, 250–300 m, 15 Nov. 1982, *Moreno 18666* (MO). **Granada:** Isla Zapatera, entre Ensenada Los Chiqueros y El Carrizal sobre el camino a Sonzapote, 11°45′N, 85°50–51′W, 40–55 m, 20 Jan. 1982, *Sandino 1886* (MO). **León:** 1 km de El Transito, camino a El Guineo, 12°03′N, 86°42′W, 10–20 m, 26 Nov. 1980, *Moreno 4809* (MO); Camino a El Velero, 4.3 km de la carretera a Puerto Sandino, 12°10′N, 86°46′W, 20 m, 10 Feb. 1981, *Moreno 6521-b* (MO); Km 47.5 Carretera Vieja a León, 12°09′N, 86°39′W, 60–80 m, 10 Aug. 1981, *Sandino 1188* (MO); along road SE from Hwy. 32 near Puerto Somoza, 3.9 km from Hwy. and 0.6 km N of road to Miramar, 12°09′N, 86°45′W, 20 m, 29 Jan. 1978, *Stevens 6226* (MO); El Velero, mouth of Estero San José, 10 km S of Hwy. 32, 12°08′N, 86°45′W, 0–5 m, 9 Sep. 1984, *Stevens 23074* (MO); slope and ridge immediately W of Quebrada Las Ruedas, NW of El Transito, 12°05′N, 86°43′W, 15–30 m, 10 Dec. 1977, *Stevens 5451* (MO). **Managua:** Camino a San Francisco Libre, 5 km W of empalme Managua-San Francisco Libre, 12°21′20″N, 86°05′W, 50 m, 11 Mar. 1983, *Grijalva 2391* (MO); Camino Darío–Presa Santa Bárbara, 8 km NW de Ciudad Darío, 12°47′10″N, 86°11′W, 80–100 m, 26 June 1983, *Grijalva 2677* (MO); Mpio. San Francisco del Carnicero, 12 km NW del pueblo en caserío La Mojarra, alrededores del Río Viejo, 12°25′N, 86°21′W, 80 m, 12 Sep. 1980, *Guzmán et al. 1089* (MO); Orilla del Río Salamina, El Charco, 13 km de la carretera a Montelimar, 12°00′N, 86°38′W, 28–50 m, 13 Nov. 1980, *Moreno 4636* (MO); 3 km de la carretera Managua–Sebaco, camino a San Francisco Libre, 26 Jan. 1981, *Sandino 364* (MO); Km 15 on Carretera Panamericana Norte, between Managua and Tipitapa, 1 Feb. 1978, *Vincelli 130* (MO). **Matagalpa:** 1–2 km de Puertas Viejas, camino a San José de Los Remates, 12°35′N, 86°01′W, 430–470 m, 10 May 1982, *Moreno 16239* (MO).

Matelea Aublet

Matelea ampiyacuensis Morillo, Caldasia 17: 418. 1995. The original description and illustration of this species, while nicely crafted, cite the type collection as "*Hahn Trewell 94.*" For the sake of herbaria holding isotypes of this interesting species, it should be pointed out that the type collection is *R. Hahn & R. Tredwell 94.*

Matelea elachyantha W. D. Stevens, sp. nov. TYPE: Nicaragua. Zelaya: along road from El Empalme to Limbaika, 2.7 km E of Alimikamba road, 13°32′N, 84°14′W, 25 m, 7 Mar. 1981, *Stevens 19446* (holotype, MO). Figure 4.

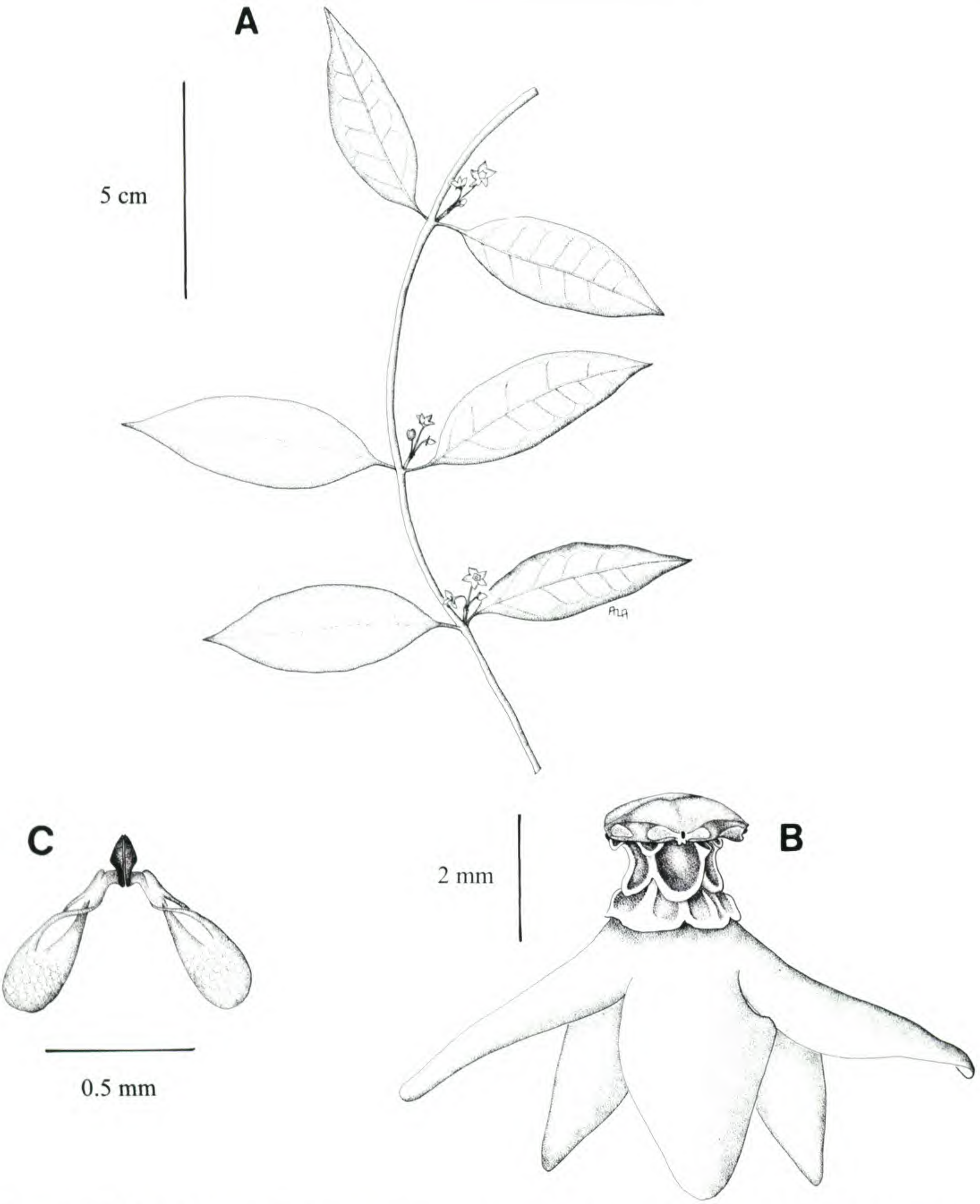

Figure 4. *Matelea elachyantha* W. D. Stevens. —A. Flowering branch. —B. Flower. —C. Pollinarium. Drawn from the type, *Stevens 19446*.

Mateleae dwyeri maxime similis, sed internodiis glabris foliis membranaceis lobis calycis viridibus.

Vine, older stems woody and corky, base unknown, young stems with appressed hairs 0.2–0.4 mm long at nodes, glabrescent, internodes 4–13 cm long. Leaves opposite, blades elliptic to ovate, 4–6.7 × 2.2–3.5 cm, apex acuminate, base acute, obtuse, rounded or truncate, glabrous or sometimes puberulent at base above, membranous, lateral veins 7 to 10 pairs, middle veins 60–85° to midrib, colleters 2; petiole 0.5–1 cm long, puberulent on upper margin. Inflorescence congested-racemiform, peduncle 1.2–2.5 mm long, glabrous or sparsely puberulent, axis to 2.5 mm long, pedicel 4.7–7.7

mm long, glabrous or sparsely puberulent, bracts 0.6–1.4 × 0.3–0.4 mm, deltate; calyx tube absent, with 1 colleter per sinus, lobes deltate to ovate, 1.6–2 × 0.8–1 mm, apex acute to rounded, green, with a few appressed hairs outside; corolla rotate-reflexed, glabrous or with a few appressed hairs outside, tube 0.7–0.9 mm long, lobes ovate, 2.8–3.6 × 1.8–2.2 mm, apex rounded; corona of two 5-lobed, fleshy, glabrous skirts covering stipe of gynostegium, outer corona 0.2–0.5 mm long, lobes opposite anthers, somewhat overlapping corolla, inner corona 0.7–0.8 mm long, lobes alternate with anthers, somewhat overlapping outer corona, terminal appendages appressed to margin of style apex, 0.2–0.25 × 1.3–1.4 mm; corpusculum 0.15–0.16 × 0.07–0.08 mm, sagittate, pale brown, translators 0.12–0.15 mm long, 0.05–0.08 mm wide, pollinia 0.47–0.48 × 0.21–0.23 mm, obovoid, sterile at attachment near center; gynostegium stipe 0.9–1.1 mm long, style apex 2–2.2 mm wide, pentagonal, shallowly convex. Follicles and seeds unknown.

This species of *Matelea* subg. *Matelea* is close to *M. dwyeri* Morillo, which was treated as *M. mediocris* Woodson in the *Flora of Panama* (Spellman, 1975). *Matelea dwyeri* is endemic to the area of Cerro Jefe, Panama, at about 800–1000 m elevation, while this new species is found at low elevations along the Caribbean coast of Nicaragua. *Matelea dwyeri* has stems with two rows of hairs (a mixture of long, reflexed hairs and short glandular hairs), coriaceous leaves with 4 to 7 pairs of veins, and calyx lobes tinted purple. *Matelea elachyantha* has glabrescent stems with a few long, reflexed hairs at the nodes, membranous leaves with 7 to 10 pairs of veins, and green calyx lobes. Both species share the unusual character of an apiculum at the leaf tip, but in *M. dwyeri* the apiculum is usually abaxially pubescent while in *M. elachyantha* it is glabrous. Most collections of *M. dwyeri* have flowers more than twice as large as those of *M. elachyantha*, but three collections, *Dressler 4315*, *Dwyer & Gentry 4814*, and *Folsom et al. 6807*, have smaller flowers more in the range of *M. elachyantha*.

Paratypes. NICARAGUA. **Jinotega:** Salto Kayaska, Río Bocay, 13°51′N, 85°22′W, 190–340 m, 7 Mar. 1980, *Stevens et al. 16495* (MO). **Zelaya:** Caño Montecristo, desembocadura del Caño El Consuelo, 11°35′N, 83°51′W, 10 m, 7 Feb. 1982, *Moreno 15077* (MO).

Matelea furvescens W. D. Stevens, sp. nov. TYPE: Costa Rica. Alajuela: Reserva Biológica Monteverde, 10°20′N, 84°43′W, 900 m, 24 Apr. 1987, *Haber & Bello 7041* (holotype, MO; isotypes, INB, MO). Figure 5.

Inter species subgeneris *Mateleae* siccitate nigrescente, floribus parvis et annulo corollae erecto distincta.

Vine, older stems and base unknown, young stems with appressed, ferrugineous hairs ca. 0.3 mm long, quickly glabrescent and becoming corky, internodes 6–18 cm long; with white latex. Leaves opposite, blades elliptic, 5.1–10.1 × 1.9–4 cm, apex bluntly acuminate to attenuate, base acute to obtuse or rounded, drying blackish, sparsely puberulent with appressed, ferrugineous hairs, lateral veins 3 to 4 pairs, middle veins 50–65° to midrib, colleters 2; petiole 1.2–2.6 cm long, glabrous, becoming corky. Inflorescence extra-axillary, congested-racemiform, peduncle 2–13 mm long, glabrous and becoming corky, axis 1–16 mm long, covered with pedicel scars and thicker than peduncle, pedicel 5.5–7.5 mm long, minutely puberulent, bracts 0.3–0.6 × 0.2–0.4 mm, deltate; calyx tube absent, with 1 colleter per sinus, lobes ovate, 0.8–1.3 × 0.6–1 mm, apex acute to rounded, apparently green, abaxially appressed-puberulent, adaxially glabrous; corolla rotate-reflexed with a prominent faucal annulus, cream to yellow, abaxially appressed-puberulent, adaxially hispidulose, hairs translucent, unicellular, erect, ca. 0.05 mm long, tube 0.4–0.6 mm long, lobes lanceolate, 2.3–3 × 1.3–1.9 mm, apex rounded, annulus erect, 0.3–0.5 mm long, distally with 10 inconspicuous, rounded lobes; corona ± horizontal on stipe of gynostegium between annulus and gynostegium, glabrous, 10-lobed with each lobe bifid at tip, 0.4–0.6 mm wide, lobes alternate with anthers deflexed and lobes opposite anthers turned upward, anthers ellipsoid, 0.4–0.5 × 0.7–0.8 mm, terminal appendages appressed to margin of style apex, 0.1–0.15 × 0.6–0.8 mm; corpusculum 0.15–0.16 × 0.07–0.09 mm, sagittate, pale brown, translators 0.07–0.08 × 0.025 mm, pollinia 0.2–0.25 × ca. 0.175 mm, angularly and asymmetrically obovoid, sterile at attachment near one edge; style apex 1.5–1.7 mm wide, nearly round, shallowly convex. Follicles fusiform, ca. 16 cm long, 1 cm wide, apex and base long-attenuate, apparently smooth, appressed-puberulent, glabrescent; seeds obovate with long-attenuate base, ca. 13.2 × ca. 4.8 mm, pale red-brown, margin 1.1–1.2 mm wide, irregularly crenate distally, surface smooth and glossy, coma 3–3.5 cm long, tawny.

This is superficially most similar to *Matelea stenopetala* Sandwith, especially in habit, inflorescence, and flowers, but differs from all other species of *Matelea* subg. *Matelea* in drying black, in having very small flowers, and in having an erect faucal annulus that encloses the stipe of the gy-

nostegium up to the corona. It seems to be rare in middle-elevation cloud forests and apparently flowers and fruits throughout the year.

Paratypes. COSTA RICA. **Alajuela:** Reserva Biológica Monteverde, Río Peñas Blancas, Poco Sol, Finca Volio, 10°20′N, 84°41′W, 900 m, 11 Dec. 1989, *Bello 1612* (INB, MO). NICARAGUA. **Chontales:** Cerro Oluma, 12°18′N, 85°24′W, 750 m, 4 Jan. 1984, *Gentry et al. 43938* (MO). **Jinotega:** Kilambé, Cerro San Pedro, 13°36′N, 85°39′W, 600–800 m, 25 Mar. 1981, *Moreno 7541* (MO). **Matagalpa:** Cerro Carlota, 12°58′N, 85°52′W, 1250–1300 m, 23 Oct. 1982, *Moreno 18157* (MO).

Matelea ocellata W. D. Stevens, sp. nov. TYPE: Mexico. Oaxaca: Mpio. Tehuantepec, Dpto. Tehuantepec, Recorrido Hierba Santa a El Limón (17 km al O de Tehuantepec), 24 July 1985, *C. Martínez R. 87* (holotype, MO). Figure 6.

Mateleae pusilliflorae affinis sed lobis corollarum angustioribus dignoscenda.

Vine, older stems woody and corky, base unknown, young stems with 2 lines of spreading to appressed, white to ferrugineous hairs 0.2–0.5 mm long and brown to red-brown glandular hairs 0.02–0.05 mm long, glabrescent, internodes 2–15 cm long. Leaves opposite, blades elliptic or ovate, 3.8–6.2(9.2) × 1.5–2.3(3.9) cm, apex acute to attenuate, base rounded to truncate or shallowly lobate, sinus to 0.2 cm deep, lobes divergent, glabrous or puberulent on midrib and margin, lateral veins 3 to 6 pairs, middle veins 35–50° to midrib, colleters 3 to 6; petiole 1–2.2 cm long, puberulent. Inflorescence racemiform, peduncle 1–4(9) mm long, puberulent, axis to 3 mm long, pedicel 4–8(14) mm long, puberulent, bracts 0.7–2.3 × 0.1–0.5 mm, linear to deltate; calyx tube 0.2–0.5 mm long, with 1 colleter per sinus, lobes lanceolate, 1.1–1.9 × 0.7–1.2 mm, apex acute to obtuse, green, glabrous inside, sparsely pubescent outside; corolla rotate, green to dull brown with darker green veins, with a dull to bright white spot at tip of each corolla lobe within, adaxially glabrous, abaxially sparsely puberulent to hispidulose, tube 0.8–2 mm long, lobes deltate or slightly ovate, 2.7–3.5 × 2.1–2.2 mm, apex acute to rounded; corona a shallowly 5-lobed disk, 0.5–1.2 mm wide, yellow to orange, glabrous, with 5 erect wings opposite and free from anthers, terminal appendages appressed to margin of style apex, 0.15–0.25 × 0.9–1.2 mm; corpusculum 0.15–0.23 × 0.07–0.18 mm, rounded-sagittate, pale brown, translators 0.15–0.2 × 0.07–0.1 mm, pollinia 0.47–0.65 × 0.3–0.38 mm, asymmetrically obovoid, sterile at attachment near center; gynostegium stipe 0.4–0.5 mm long, style apex 1.8–2 mm wide, rounded-pentagonal, flat, sometimes with 5 radial ridges. Follicles and seeds unknown.

This new species is most closely related to *Matelea pusilliflora* L. O. Williams, from Mexico (Chiapas), Belize, and Guatemala, which until now was the only mainland representative of a small group of Caribbean species characterized by asymmetrical, narrowly 5-winged follicles, a corona in the form of a fleshy disk at the base of the gynostegium stipe, and a white, reflective eye at the tip of each corolla lobe. *Matelea pusilliflora* has broader corolla lobes and a relatively broader and flatter corona that lacks the erect wings opposite the anthers.

Paratypes. MEXICO. **Michoacán:** Mpio. Aquila: Cruz de Campos, 4 km al NE de la carretera Tecomán–Playa Azul, rumbo a Aquila, 24 Sep. 1983, *E. Martínez S. et al. 4453* (MO). **Oaxaca:** Mpio. San Miguel Chimalapa, Cañada de Las Naranjas, ca. 2.5 km al SO de La Coralilla (Díaz Ordáz), ca. 35 km en línea recta al N de San Pedro Tapanatepec, 16°42′N, 94°11′W, 1100 m, 29 July 1985, *Maya 1933* (CHAPA, MO); Mpio. San Miguel Chimalapa, Río Escondido (Arroyo Baúl), 0.1–1.0 km al O de su unión con el Río Portamonedas y de Benito Juárez, ca. 38 km en línea recta al N de San Pedro Tapanatepec, 16°43′N, 94°09′W, 900 m, 8 Oct. 1985, *Maya 2335* (CHAPA, MO). NICARAGUA. **Matagalpa:** Camino a Esquipilas, Carretera Norte entrando por Puertas Viejas, 500–1000 m, 18 Oct. 1984, *Grijalva & Soza 4050* (MO).

Matelea sugillata W. D. Stevens, sp. nov. TYPE: Mexico. Veracruz: Mpio. Atzalán, La Calavera, 1000 m, 12 Apr. 1973, *Ventura 8158* (holotype, MO). Figure 7.

Ex affinitate *Mateleae picturatae* et specierum affinium corolla hispidula distinguenda.

Vine, older stems slightly woody but not corky, base unknown, young stems with 2 lines of spreading, contorted, white hairs 0.2–0.5 mm long and appressed, ferrugineous hairs 0.02–0.1 mm long, glabrescent, internodes 4–36 cm long. Leaves opposite, blades elliptic or ovate, 9.1–17 × 4–12 cm, apex acuminate, base rounded, truncate, shallowly lobate, or shallowly cordate, sinus to 0.5 cm deep, lobes divergent, drying blue-black, glabrous above, sparsely appressed ferrugineous-pubescent below, especially on veins, lateral veins 3 to 5 pairs, middle veins 40–50° to midrib, colleters 4 to 6; petiole 2.9–8.5 cm long, sparsely appressed ferrugineous-pubescent. Inflorescence racemiform to paniculiform, sparsely appressed ferrugineous-pubescent, peduncle 19–96 mm long, axis to 30 mm long, pedicel 24–57 mm long, bracts 1.2–2 × 0.3–0.5 mm, lanceolate; calyx tube 0.3–0.5 mm long, with 1 to 2 colleters per sinus, lobes ovate to nearly deltate, 2.8–5 × 1.8–2.5 mm, apex acute to rounded, green,

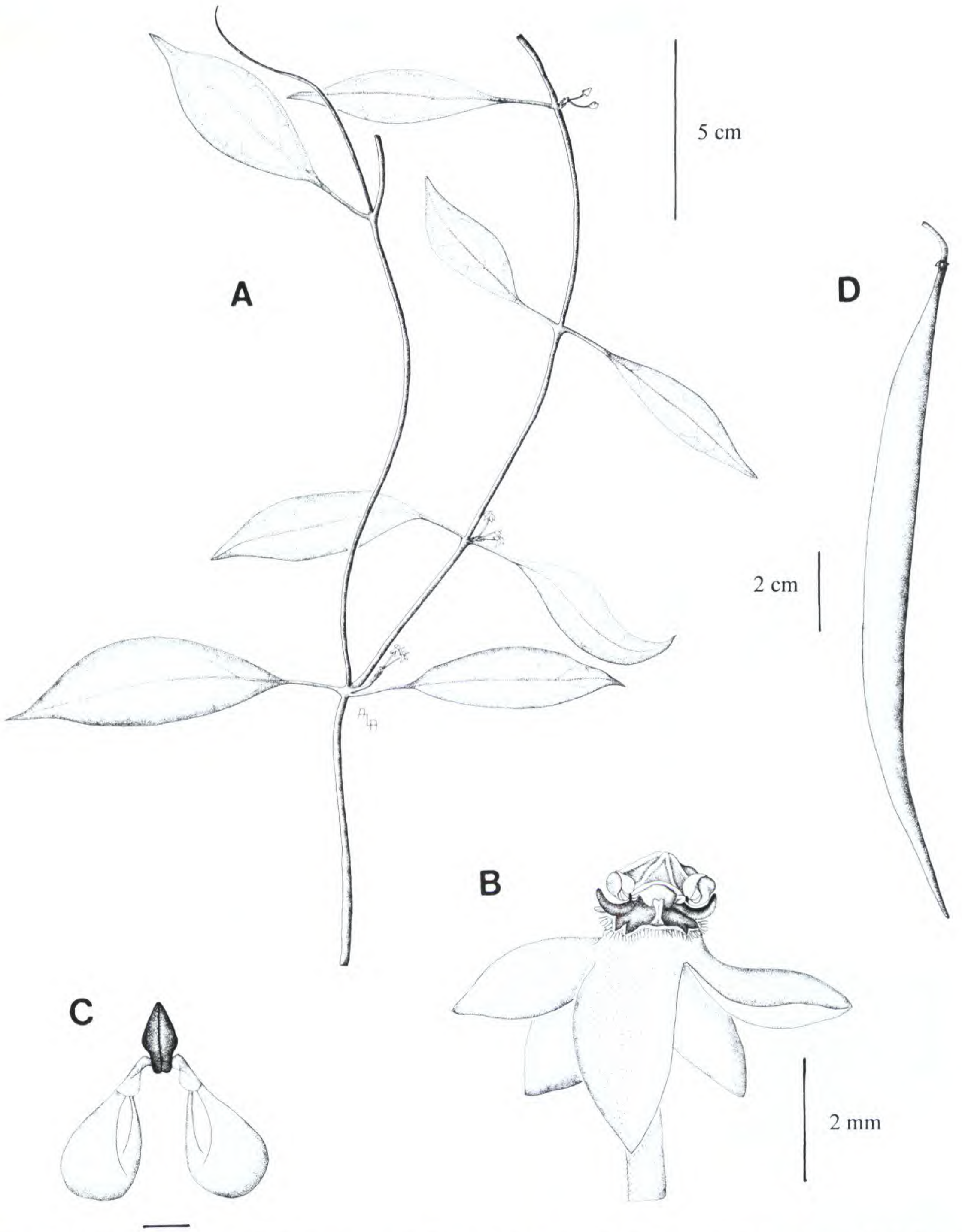

Figure 5. *Matelea furvescens* W. D. Stevens. —A. Flowering branch. —B. Flower. —C. Pollinarium. —D. Follicle. A, D drawn from the type, *Haber & Bello 7041*, B drawn from *Bello 1612*, C drawn from *Moreno 7541*.

adaxially glabrous, abaxially appressed ferrugineous-pubescent; corolla rotate with an inconspicuous circular annulus, green to pale brown with darker green veins, adaxially densely hispidulose with unicellular hairs 0.07–0.13 mm long, abaxially sparsely appressed ferrugineous-pubescent, tube 4–6.5 mm long, lobes ovate, 6.5–15 × 6.3–11.1 mm, apex rounded; corona a rounded-pentagonal disk surrounding gynostegium, 0.6–1 mm wide, pale yellow, glabrous, with low ridges opposite and appressed

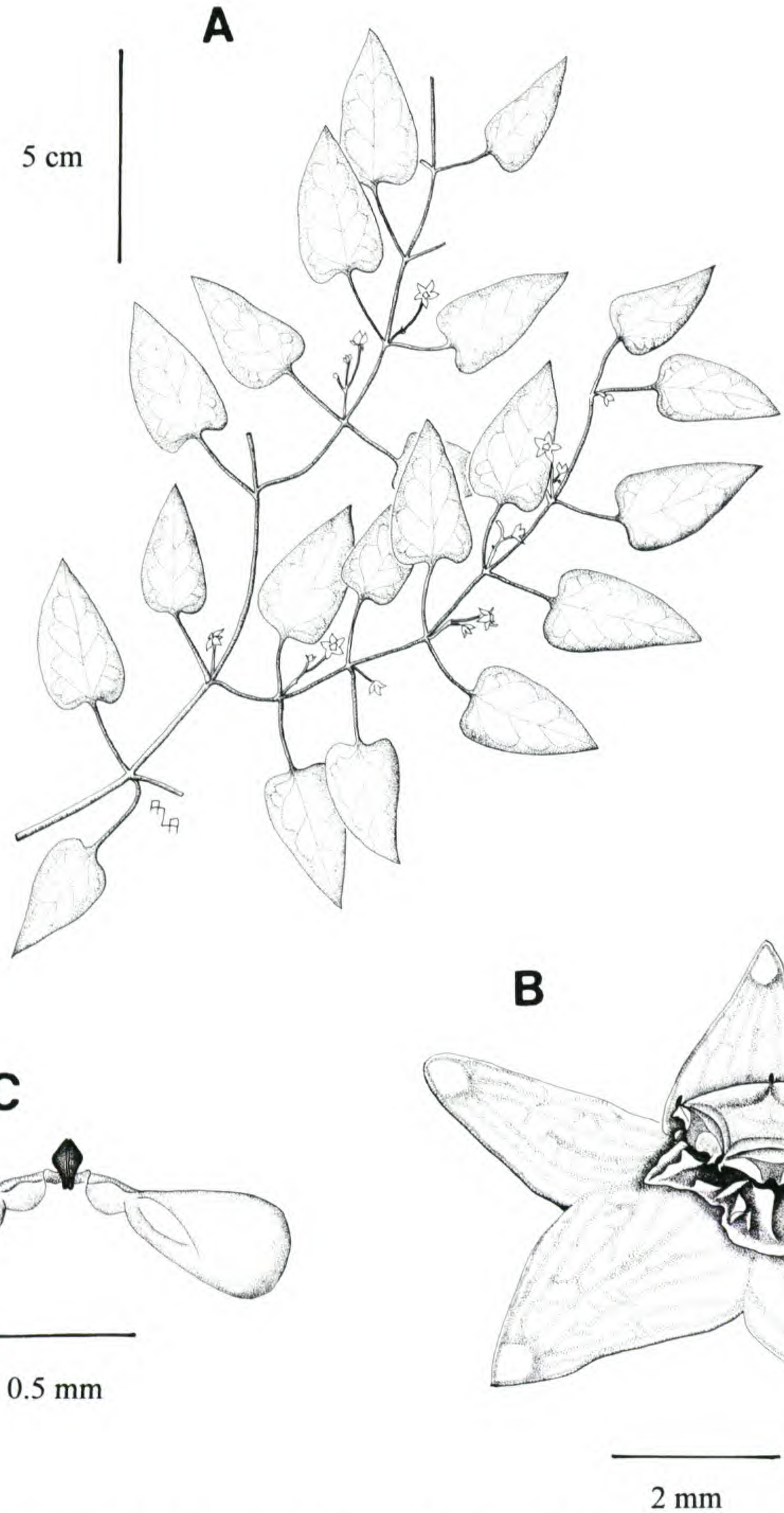

Figure 6. *Matelea ocellata* W. D. Stevens. —A. Flowering branch. —B. Flower. —C. Pollinarium. A, B drawn from the holotype, *Martínez R. 87*, C drawn from *Maya 2335*.

to anthers and shallow concavities alternate with anthers, terminal appendages appressed to and covering style apex, deltate, 0.5–0.9 × 0.8–1.2 mm, bright white; corpusculum 0.17–0.23 × 0.15–0.18 mm, rounded-sagittate, pale brown, translators 0.17–0.2 × 0.1–0.13 mm, pollinia 0.57–0.68 × 0.3–0.38 mm, obovoid, strongly asymmetrical, sterile at attachment near center; style apex 1.9–2.3 mm wide, pentagonal, shallowly convex. Follicles and seeds unknown.

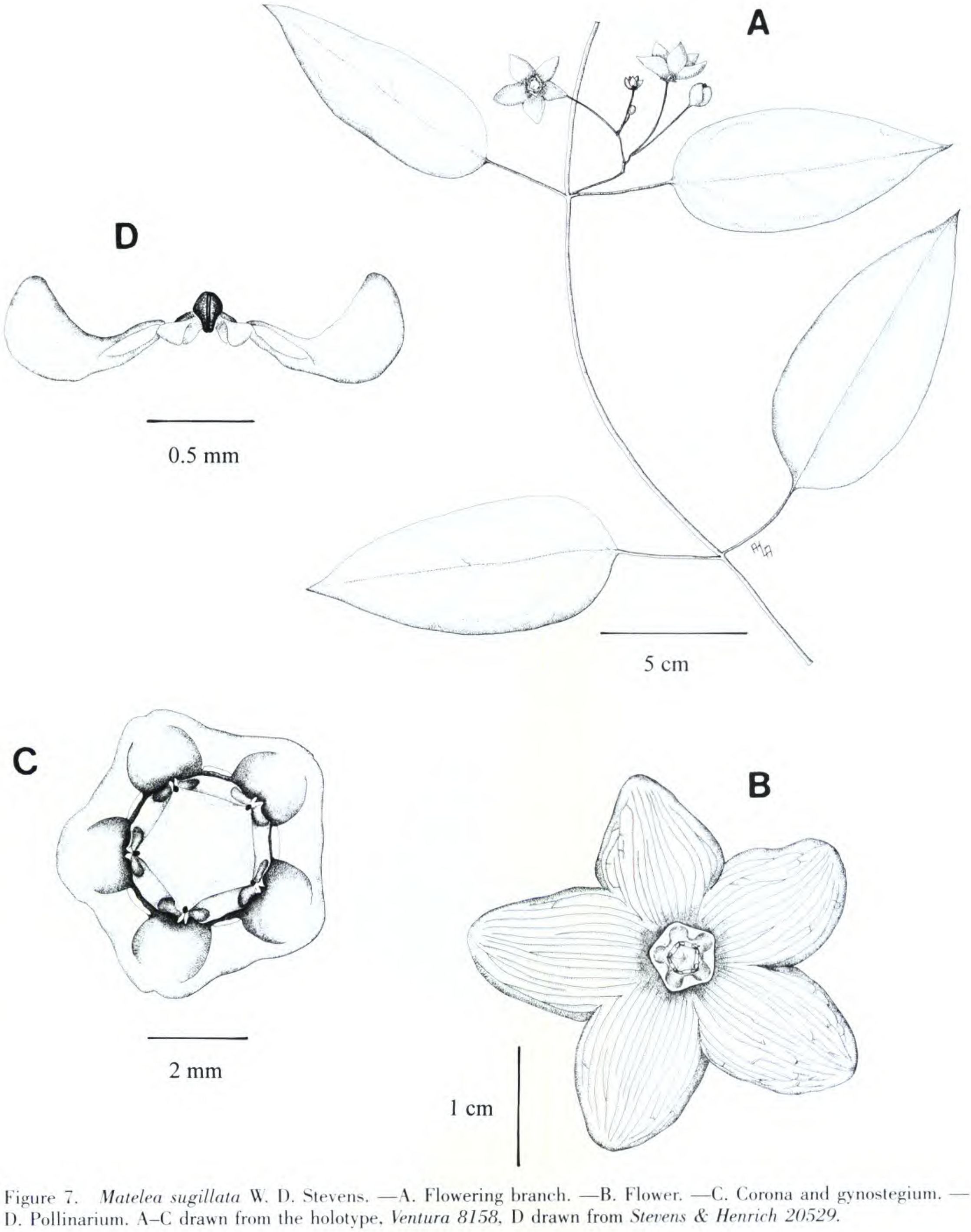

Figure 7. *Matelea sugillata* W. D. Stevens. —A. Flowering branch. —B. Flower. —C. Corona and gynostegium. —D. Pollinarium. A–C drawn from the holotype, *Ventura 8158*, D drawn from *Stevens & Henrich 20529*.

The Mexican collections of this species have been previously determined as *Matelea picturata* (Hemsley) Woodson, a species (including *M. pittieri* (Standley) Woodson and *Vincetoxicum discolor* Woodson) known from Guatemala and Panama, which has the inner face of the corolla densely villose. Also similar are *M. tinctoria* Woodson, endemic to Costa Rica and with the inner face of the corolla entirely glabrous, and *M. sylvicola* L. O. Williams, endemic to Guatemala and with the inner face of the corolla villose but with the corolla lobes narrower than the other species and much longer than the corolla tube. These four species are obviously closely related and share the character of

quickly turning blue-black when bruised. I have seen fruits of none of these species, and their relationships within *Matelea* are not clear.

Paratypes. MEXICO. **Oaxaca:** Mpio. Santa María Chimalapa, Filo entre Majipana y Río Blanco, ca. 15 km al ESE de Santa María, 16°52′N, 94°34′30″W, 810 m, 27 May 1987, *Hernández 2499* (MO). **Queretaro:** Mpio. Landa, 2 km al SE de Río Verdito, 1000 m, 13 Mar. 1989, *Rubio 513* (MO). **Veracruz:** Mpio. Catemaco, Arroyo Claro, 19 km al SO de Tebanca y 3 km de Bastonál, 21 Feb. 1985, *Cedillo 3059* (MO); Mpio. Yecuatla, Km 9, 650 m, 23 Aug. 1972, *Ventura 5922* (MO). NICARAGUA. **Jinotega:** Laguna Miraflores, ca. 52 km (by road) NE of Estelí, 13°15′N, 86°15′W, 1250–1300 m, *Stevens & Henrich 20529* (MO).

Metaplexis R. Brown

In the recent *Flora of China* (Li Ping-tao et al., 1995), *Metaplexis rostellata* Turczaninow was placed in synonymy of *M. hemsleyana* Oliver. Examination of an isotype of *M. rostellata* (*R. Fortune A87,* MO) and a review of the original description confirms the opinion of previous authors that the name is properly a synonym of *M. japonica* (Thunberg) Makino.

Metastelma R. Brown

Metastelma schlechtendalii Decaisne was described with three syntypes, *Schiede 159* and *Galeotti 1541* from Veracruz, Mexico, and *Wydler 76* from St. Thomas. To stabilize the usage of the name, I propose selecting a lectotype that matches the original description and is well represented in herbaria, *Schiede 159.* Of the collections not selected, *Galeotti 1541* probably represents the same species but *Wydler 76* almost certainly does not.

Metastelma schlechtendalii Decaisne, in A. DC., Prodr. 8: 513. 1844. TYPE: Mexico. Veracruz: Hacienda de la Laguna, Aug. 1828, *Schiede 159* (lectotype, selected here, P; isolectotypes, HAL, MO, W).

Acknowledgments. I thank Alba Arbeláez for her patience in producing the drawings and Barry Hammel for kindly checking specimens in Costa Rica. Victoria Hollowell, Amy Pool, and Eric Sundell provided astute recommendations for improving the manuscript.

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Una Nueva Especie de *Rhynchosia* (Leguminosae) de Jalisco, México

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RESUMEN. Se describe una nueva especie de *Rhynchosia* (Leguminosae) del occidente de México, colectada en la Reserva de la Biósfera Chamela-Cuixmala, Jalisco, México. Se trata de *R. delicatula*, la cual es cercana a *R. difformis* (Elliot) DC.: de esta, *R. delicatula* se diferencia por la forma y pelosidad de sus folíolos; pedicelos más cortos; cáliz más corto que la corola; y el vexilo más chico.

ABSTRACT. A new species of *Rhynchosia* (Leguminosae) collected in the Chamela-Cuixmala Biosphere Reserve in the state of Jalisco, western Mexico, is described. *Rhynchosia deliculata* is similar to *R. difformis* but differs by the shape and pubescence of the leaflets, by the shorter pedicels, by the calyx shorter than the corolla, and by the smaller standard petal.

Durante septiembre de 1997 y septiembre de 1998, el Herbario Nacional (MEXU) del Instituto de Biología realizó colecciones como parte del proyecto Flora de la Reserva de la Biósfera Chamela-Cuixmala, Jalisco, México. En este período se recolectaron alrededor de 5000 números. Estas colecciones incluyen varias especies nuevas para la ciencia, una de las cuales es descrita aquí, de la cual se brindan datos acerca de su distribución geográfica, de sus preferencias ecológicas y se discuten las relaciones con las especies más cercanas.

Rhynchosia delicatula O. Téllez & M. Sousa, sp. nov. TIPO: México. Jalisco: Mpio. La Huerta; a 3 km de las oficinas de la Fundación Ecológica Cuixmala A. C. rumbo a El Mirador, 19°25′49″N, 104°58′41″O, alt. 200 m, 15 nov. 1997, *J. Calónico S., O. Téllez V., A. Domínguez M. y J. Martínez C. 5633* (holótipo, MEXU; isótipo, MO). Figura 1.

Herba delicata, scandens. Folia 3-foliolata, 5.5–16 cm longa; stipulis ca. 2 mm longis, 1–2 mm latis, triangulari-acutis. Inflorescentiae axillares 1.5–4 cm longae. Flores 5–8 mm longi; calyce 5–7 mm longo; lobulo vexillari 5–5.5 mm longo, lateralibus 5.2–5.5 cm longis, carinali 6–6.3 mm longus. Legumen immaturum ca. 1.8 cm longum, ca. 6 mm latum; seminibus immaturis 2.

Herbácea trepadora; tallos lineados, puberulentos; pecíolo 1.5–5.5 cm de largo, hirsutuloso; estípulas ca. 2 mm de largo, 1–2 mm de ancho, triangulares, agudas, castaño–rojizas, puberulentas. Hojas 5.5–16 cm de largo; folíolos 3, el terminal 2.5–9.5 cm de largo, 1.2–4 cm de ancho, ovado-lanceolado a lanceolado, la base redondeada, el ápice acuminado, mucronado, los laterales 2.5–7.5 cm de largo, 1–3.5 cm de ancho, semifalcados, la base oblicua, el ápice acuminado, todos con el haz estriguloso, el envés hirsutuloso sólo sobre las nervaduras, seríceo, densamente cubierto por secreciones glandulares ambarinas. Inflorescencias racimos axilares 1.5–4 cm de largo, más cortas que las hojas; brácteas lineares; pedicelos ca. 1 mm de largo. Flores 5–8 mm de largo, amarillas a anaranjadas; cáliz 5–7 mm de largo, campanulado, el lóbulo vexilar 5–5.5 mm de largo, unido 3/4 de su longitud o más, los lóbulos laterales 5.2–5.5 cm de largo, el lóbulo carinal 6–6.3 cm de largo, lanceolados, agudos a acuminados; vexilo 6–7 mm de largo, 3–5 mm de ancho, la uña 1 mm de largo; alas 4–4.5 mm de largo, 1.5–2 mm de ancho, la uña 1–1.5 mm de largo; carina 4.5–5 mm de largo, 2–2.5 mm de ancho, la uña 1–1.5 mm; tubo estaminal 4.5 mm de largo en su porción unida; óvulos ca. 2. Legumbre inmadura ca. 1.8 cm de largo, ca. 6 mm de ancho; semillas ca. 2, inmaduras.

Parátipos. MEXICO. **Jalisco:** Mpio. La Huerta; km 1.380 del Eje Central, Estación de Biología Chamela, UNAM, 5 nov. 1988, *S. H. Bullock 1961* (MEXU); a 6 km al NW de las oficinas de la Fundación Ecológica Cuixmala AC., sobre el camino rumbo a El Mirador, 19°26′49″N, 104°57′55″O, 15 nov. 1997, *J. Calónico S., O. Téllez V., A. Domínguez M. y J. Martínez C. 5746* (MEXU).

Rhynchosia delicatula pertenece a la sección *Arcyphyllum* Torrey & A. Gray, conjuntamente con 15 especies más, distribuidas desde el sur de los Estados Unidos y El Caribe hasta Argentina (Grear, 1978). Las especies de ésta sección se caracterizan por poseer un cáliz foliáceo a subfoliáceo, con los lóbulos libres o casi libres des-

Figura 1. *Rhynchosia delicatula* O. Téllez & M. Sousa. —A. Hábito de la planta. —B. Cáliz. —C. Estandarte. —D. Ala. —E. Quilla. —F. Tubo estaminal mostrando el estambre vexilar. —G. Gineceo.

de la base, lanceolados, casi tan largos como el estandarte o más largos que este. *Rhynchosia delicatula* se encuentra relacionada, por una parte, a un grupo de especies con inflorescencias más cortas que las hojas y hojas sin estipelas, distribuidas en el sur de Estados Unidos y el occidente de México, y por otra parte, se relaciona a un grupo de especies sudamericanas que poseen inflorescencias con las flores agrupadas y congestas hacia el ápice; sin embargo, las relaciones más estrechas parecen ser con *R. tarphanta* Standley y *R. elisae* O. Téllez, las cuales poseen inflorescencias robustas, flores de mayor tamaño y habitan en bosques de *Pinus-Quercus* entre 650–1500 y en bosques mesófilos a más de 900 m de altitud, respectivamente, mientras que *R. delicatula* se distingue claramente por lo delicado de la planta y de las inflorescencias, el menor tamaño de las flores y porque habita en la selva baja caducifolia del nivel del mar a 200 m.

Aparentemente las montañas del occidente de México han sido un centro secundario de diversificación para parte de la sección *Arcyphyllum*. Las especies señaladas y relacionadas entre sí se distribuyen en ellas, *Rhynchosia tarphanta* en porciones altas de la Sierra Madre del Sur en los estados de Jalisco y Guerrero (McVaugh, 1987), *R. elisae* en la porción occidental del Eje Volcánico Transversal en el estado de Nayarit (Téllez, 1995) y *R. delicatula* en las estribaciones de la Sierra Madre del Sur en la costa de Jalisco cerca del nivel del mar.

A la clave de Grear (1978) se le agrega la especie nueva a partir de la entrada 33, dentro de la Sección II. *Arcyphyllum*, Serie 5, en la siguiente forma.

33. Estípulas caducas; legumbre 2.5–3.5 cm; semillas 5–6 mm; México (Jalisco, Guerrero, Oaxaca) . . . . . *R. tarphantha*
33. Estípulas persistentes; legumbres 1–2 cm; semillas 2–4.5 mm.
    34. Estipelas ausentes; tallos volubles o postrados.
        35. Folíolos generalmente coriáceos, pelosidad cinérea; vexilo 6–8 mm de ancho; Estados Unidos (Florida) . . . . *R. cinerea*
        35. Folíolos de membranáceos a subcoriáceos, pelosidad canescente a amarillenta; vexilo 3–6 mm de ancho.
            36. Folíolos generalmente ovados a ovado-rómbicos, estrigulosos; pedicelos 2–5 mm; cáliz más largo a casi tan largo como la corola; vexilo 8–10 × 5.6 mm; Estados Unidos (Virginia a Texas) . . . . . *R. difformis*
            36. Folíolos ovado-lanceolados a lanceolados, puberulentos; pedicelos ca. 1 mm; cáliz más corto que la corola; vexilo 6–7 × 3–5 mm; México (costa de Jalisco) . . . . . *R. delicatula*

Agradecimientos. A Elvia Esperanza por el excelente dibujo de la especie; a CONABIO por el apoyo económico para realizar el proyecto L-289 acerca de la *Flora de la Estación de Biología Chamela UNAM, Jalisco, México* que fue en donde registró esta nueva especie.

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A New Species of *Justicia* (Acanthaceae) from Venezuela

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ABSTRACT. Current floristic research in Venezuela has resulted in the recognition of another new species of *Justicia*. This new species, *Justicia aymardii*, presently known from the slopes of the eastern Andes, the Sierra Nevada de Merida, is described, illustrated, and compared to its closest relative, *Justicia ischnorhachis* Leonard, which is from Colombia. It alone among *Justicia* has the combination of (1) a 4-parted calyx, (2) multicellular purplish colored trichomes along the stem, peduncles, and rachis, and (3) a conspicuous purplish to reddish purple, long, somewhat curved, tubular corolla (20–28 mm long) with relatively short lips (8–9 mm long). This new species does not appear to be closely related to any of the known species of *Justicia* from Venezuela.

Justicia is the largest and taxonomically most complex genus of Acanthaceae, with ca. 600 species worldwide (Graham, 1988; Mabberly, 1997). It is also the largest genus of the family in Venezuela, with about 45 species found there. The genus is characterized by the gamopetalous and zygomorphic corollas with the tube divided above into 2 lips, the upper lip erect, shallowly bilobed or, more rarely, entire, and the lower one usually somewhat spreading and distinctly trilobed. *Justicia* also has an androecium of two 2-thecous stamens and no staminodes, and 2-, 3- or 4-aperturate pollen with a trema area usually transversed by 2 to 8 rows of up to 10 insulae (Fig. 2), and stipitate capsules with four (or fewer) seeds.

Justicia aymardii Wasshausen, sp. nov. TYPE: Venezuela. Barinas: Dtto. Bolívar, La Soledad, 20 km SW of Barinitas, 700 m, 20 June 1983, *G. Aymard & F. Ortega 2281* (holotype, US; isotype, PORT). Figures 1, 2.

Suffrutex, caulibus quadrangularibus, pilosis. Foliorum lamina anguste ovata vel lanceolata, acuta vel acuminata, basi attenuata, subcoriacea, utrinque pilosa, costa et venis lateralibus pilosis; petioli pilosi; spicae terminales et axillares, pedunculis et rachidibus quadrangularibus, pilosis; bracteae viridae, anguste ovatae, puberulae, ciliatae; bracteolae subulatae, parce hirtellae; calycis segmenta 4, viridia, lance-subulata, minute puberula; corolla purpurea, parce pilosa, tubo anguste infundibuliformi, labio superiore erecto, ovato, acuto, labio inferiore trilobato, lobis ovatis, medio obtusis, lateralibus retusis; stamina exserta; lobis antherarum obliquis superpositis.

Shrub or undershrub, 0.8–2 m tall. Stems ascending, quadrangular-ridged, conspicuously pilose, the trichomes erect and scattered and purplish colored, 1–1.5 mm long. Leaves petiolate, petioles 7–15 cm long, pubescence similar to that of stem, blades narrowly ovate to lanceolate, 7.5–11 × 2.2–4 cm, apically acute to acuminate, attenuate at base, subcoriaceous, entire, dark green and sparingly pilose and puberulous above, the pilose trichomes adpressed, somewhat lighter green and moderately pilose below, the trichomes adpressed and purplish colored, the costa and lateral veins (7–9 pairs) pilose, the cystoliths often inconspicuous and scattered. Inflorescence of compact, terminal and axillary spikes (Fig. 1), these barely exceeding the terminal leaves, the uppermost spike sometimes forked or sparingly branched forming a loose panicle, 3–5 cm long, the peduncles 8–25 mm long, quadrangular, densely pilose, the trichomes erect and purplish colored, the rachis similar to the peduncles; bracts narrrowly ovate, 3.5–5.5 × 2–2.5 mm, apically acuminate, clasping basally, rather firm, moderately pubescent, especially along the costa, the trichomes erect, the margin ciliolate; bracteoles subulate, 3.5 × 0.5 mm, sparingly hirtellous, especially along the costa, the margin ciliolate; calyx 8–12 mm long, deeply 4-parted, lobes green, lance-subulate, 7–10 × 0.8–0.9 mm, the pubescence similar to that of the bracts and bracteoles; corolla purple to reddish purple, 20–28 mm long, externally sparingly pilose, tube 1.5 mm at base, narrowed to 1.2 mm at 2 mm above base, thence gradually enlarged to 3.25 mm at mouth, the lips subequal, 8–9 mm long, the upper lip erect, ovate, 4 mm wide near the base, narrowed toward tip, apically acute, the lower lip somewhat spreading, oblong, 4–5 mm wide, 3-lobed, the lobes ovate, 1 mm long, the middle lobe 1.5 mm wide, apically obtuse, the lateral ones 1 mm wide, apically retuse; stamens exserted 6–7 mm beyond mouth of corolla tube, glabrous, the filaments flattened, glabrous, the anthers 1.5 mm long, the thecae 1.5 mm long, superposed at an angle to each

Figure 1. *Justicia aymardii* Wasshausen (*Aymard & Ortega 2281*, holotype). —A. Habit. —B. Bract. —C. Bracteoles and calyx lobes. —D. Cupula, ovary, and style. —E. Corolla. —F. Capsule, retinacula, and seeds.

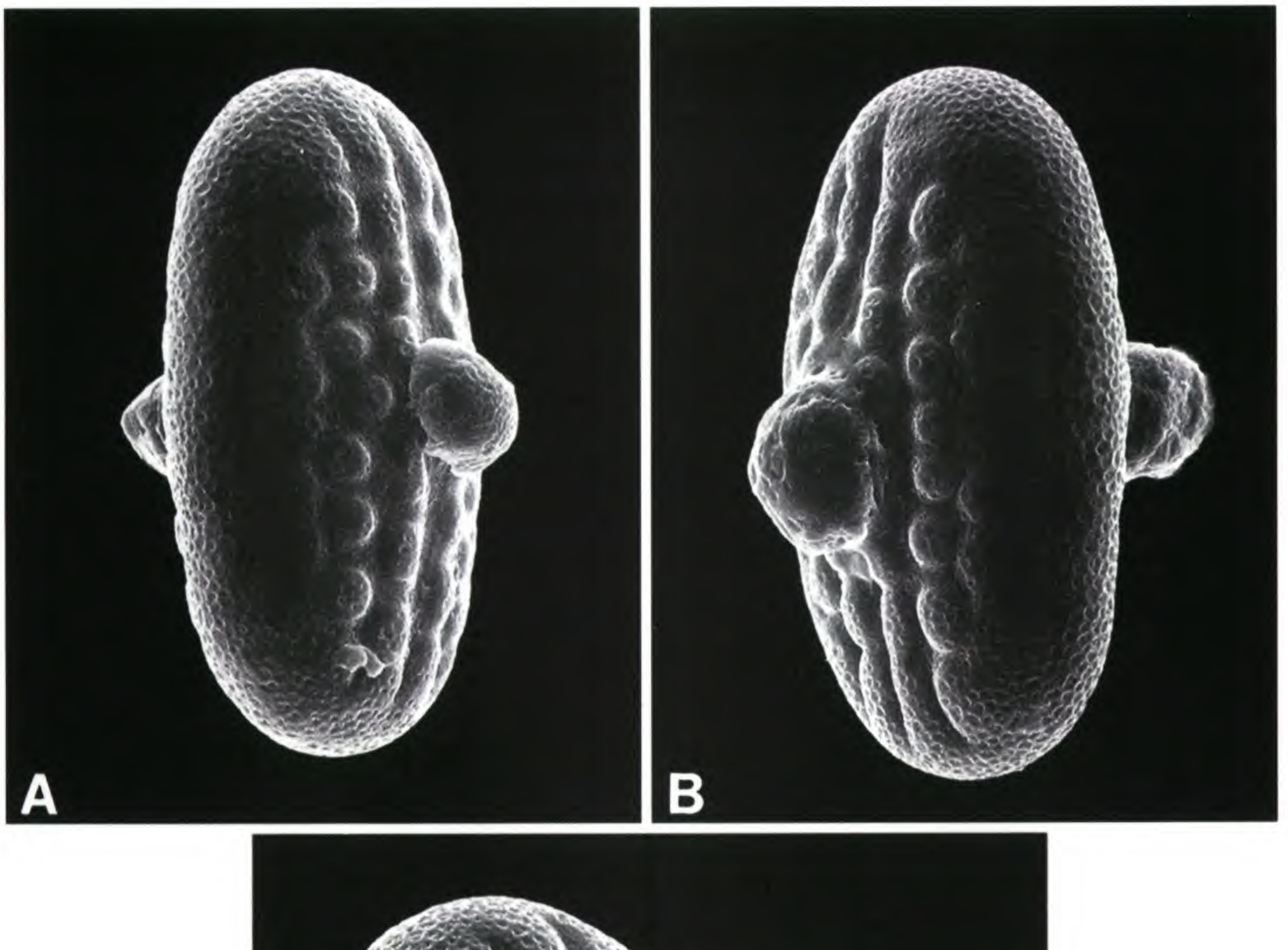

Figure 2. Scanning electron (SEM) photomicrographs of *Justicia aymardii* pollen (*Aymard et al., 4272*). —A. Equatorial view, ×1400. —B. Equatorial view, ×1400. —C. Equatorial view, ×1700.

other, the lower thecae calcarate; pollen 2-porate, prolate to perprolate, 50 × 22 μm, the pores circular, the membranes reticulate, trema area studded with 4 rows of 5–7 ± circular insulae (Fig. 2A, B, C); ovary pubescent, style filiform, pubescent, exceeding the stamens, the stigma oblique. Capsule clavate, 9–9.25 × 2.25 × 1.25 mm, apically acute; retinacula 2 mm long, slightly curved, erose; seeds 4, suborbicular, brownish, 1.75 mm diam., 0.5 mm thick, tuberculate.

Distribution. Endemic to Venezuela; plants occur in cloud forests, coffee plantations, and montane forest in the states of Portuguesa, Barinas, and Táchira at elevations between 700 and 1500 m.

Justicia aymardii superficially resembles *J. ischnorhachis* Leonard from Villavicencio, Meta, Colombia. In *J. ischnorhachis* the leaf blades are moderately firm, obtuse or rounded basally, apically slenderly acuminate, the tip often curved, the petioles 3–8 mm long, glabrous or sparingly puberulous, the spikes 3–12 cm long, the peduncles slender, glabrous, the calyx lobes stramineous, and the corollas red, reddish straw-colored, dull crimson, or reddish orange, 26–30 mm long, with the lateral lobes of the lower lip obtuse. By contrast, in *J. aymardii* the leaf blades are coriaceous, attenuate basally, apically acute to acuminate, the tip not curved, the petioles 7–15 mm long, conspicuously pilose with purplish colored trichomes, the spikes 3–5 cm long, the peduncles firm, densely pilose with purplish colored trichomes, the calyx lobes green, and the corollas purple to reddish purple, with the lateral lobes of the lower lip retuse.

Justicia aymardii is not readily identifiable with any subgeneric taxa using the keys and descriptions provided by Graham (1988). It has pollen ("Type 7," fig. 5 in Graham, 568) like that found in five sections recognized by Graham.

Paratypes. VENEZUELA. **Portuguesa:** Dtto. Sucre, La Divisorial de la Concepción, 5 km NW of Las Flores settlement, 9°18′N, 70°6′W, 1300–1500 m, 15 Oct. 1985, *G. Aymard et al. 4272* (PORT, US). **Barinas:** Dtto. Bolívar, 30 km W of Barinitas, road Barinitas–Santo Domingo, Quebrada San Isidro, 8°42′N, 70°25′W, 1600 m, 19 Nov. 1982, *G. Aymard et al. 1653* (PORT, US); Dtto. Pedraza, trail from Mesa de Canagua (ca. 8°32′N, 70°39′W) to Alto de La Aguada (ca. 8°37′N, 70°40′W), ca. 23 km NW of Curbatí, 800–1400 m, 17 Apr. 1988, *L. J. Dorr et al. 4754* (NY, US). **Táchira:** Dtto. Uribante, Hydroelectric Uribante-Capaso Complex, sector El Cedral, vicinity Presa La Honda, 8°1′N, 71°37′W, 1100–1250 m, 15 Nov. 1988, *R. Rivero et al. 1882* (PORT, US).

Acknowledgments. My special thanks to Cathy Pasquale for skillfully preparing the line drawing, and to the staff of the National Museum of Natural History SEM Laboratory for their high-quality pollen photomicrographs.

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New Species of Lauraceae from Central Amazonia, Brazil

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ABSTRACT. Fourteen new species of Lauraceae, belonging to the genera *Licaria*, *Ocotea*, and *Rhodostemonodaphne* and all occurring in or near the Reserva Florestal Ducke, near Manaus, Brazil, are described. The new species are *Licaria aureosericea* van der Werff, *L. hirsuta* van der Werff, *Ocotea cinerea* van der Werff, *O. delicata* Vicentini, *O. immersa* van der Werff, *O. ligulata* van der Werff, *O. minor* Vicentini, *O. nigrescens* Vicentini, *O. obliqua* Vicentini, *O. percurrens* Vicentini, *O. rhodophylla* Vicentini, *O. scabrella* van der Werff, *O. subterminalis* van der Werff, and *Rhodostemonodaphne recurva* van der Werff. A key to the 37 *Ocotea* species of the Reserva Florestal Ducke is provided.

During fieldwork by the second author in preparation of a field guide to the vascular plants of the Reserva Florestal Ducke (Ribeiro et al., 1999), near Manaus, Brazil, a number of Lauraceae were found that could not be identified. The proximity of the Reserva Ducke to Manaus made it possible to collect flowers and fruits from the same tagged trees and to search for, and find, staminate and pistillate trees of most dioecious species. Several of these species are here described. A number of the new species had earlier been recognized as undescribed, but a description was postponed until more complete material was available. Some of the new species, such as *Ocotea cinerea* and *O. nigrescens*, have a wide distribution throughout the Amazon lowlands. Others are only known from a few better-collected localities such as Saül in central French Guiana (for instance *Ocotea scabrella*) or the vicinity of Iquitos in Peru (for instance *Ocotea immersa*). The fact that intensive collecting in a relatively small patch of Amazonian rainforest has yielded so many undescribed species underscores our lack of knowledge about Lauraceae in the Amazon lowlands. Further collecting will no doubt lead to the discovery of more unknown species.

The habitat information is based on observations made at the Ducke reserve, with the exception of *Ocotea ligulata*, where it is based on label information.

In order to facilitate identification of *Ocotea* collections from central Amazonia, we have included a key to the *Ocotea* species known from the Ducke Reserve as well as a table listing the differences between nine of the new *Ocotea* species and four other species with which they had been confused. More details about the Lauraceae from the Ducke Reserve will be published in the Lauraceae treatment for the *Florula of the Reserva Florestal Ducke* (in prep.).

Licaria aureosericea van der Werff, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W, tree 1755-06, 22 July 1994 (fl), *A. Vicentini et al. 644* (holotype, INPA; isotypes, IAN, INPA, K, MO, NY, RB, SP). Figure 1.

Licariae oppositifoliae similis sed foliis alternis, subtus aureosericeis ramulisque tomentellis recedit.

Medium-sized trees, to 17 m. Twigs terete, solid, densely golden brown pubescent when young, the hairs erect, somewhat curled, completely covering the surface, the indument wearing off on older twigs; terminal buds densely pubescent with ascending hairs, the surface completely covered. Leaves 10–18 × 3–6.5 cm, alternate, elliptic, chartaceous; the apex acuminate or acute, acumen to 1 cm long; the base acute; upper surface moderately appressed pubescent when young, becoming glabrous with age; lower surface densely golden sericeous when young, the surface completely covered by the indument, this turning duller brown with age; midrib, lateral veins, and tertiary venation immersed on the upper leaf surface, midrib raised, lateral veins weakly raised and tertiary venation immersed on the lower surface, lateral veins 5 to 7

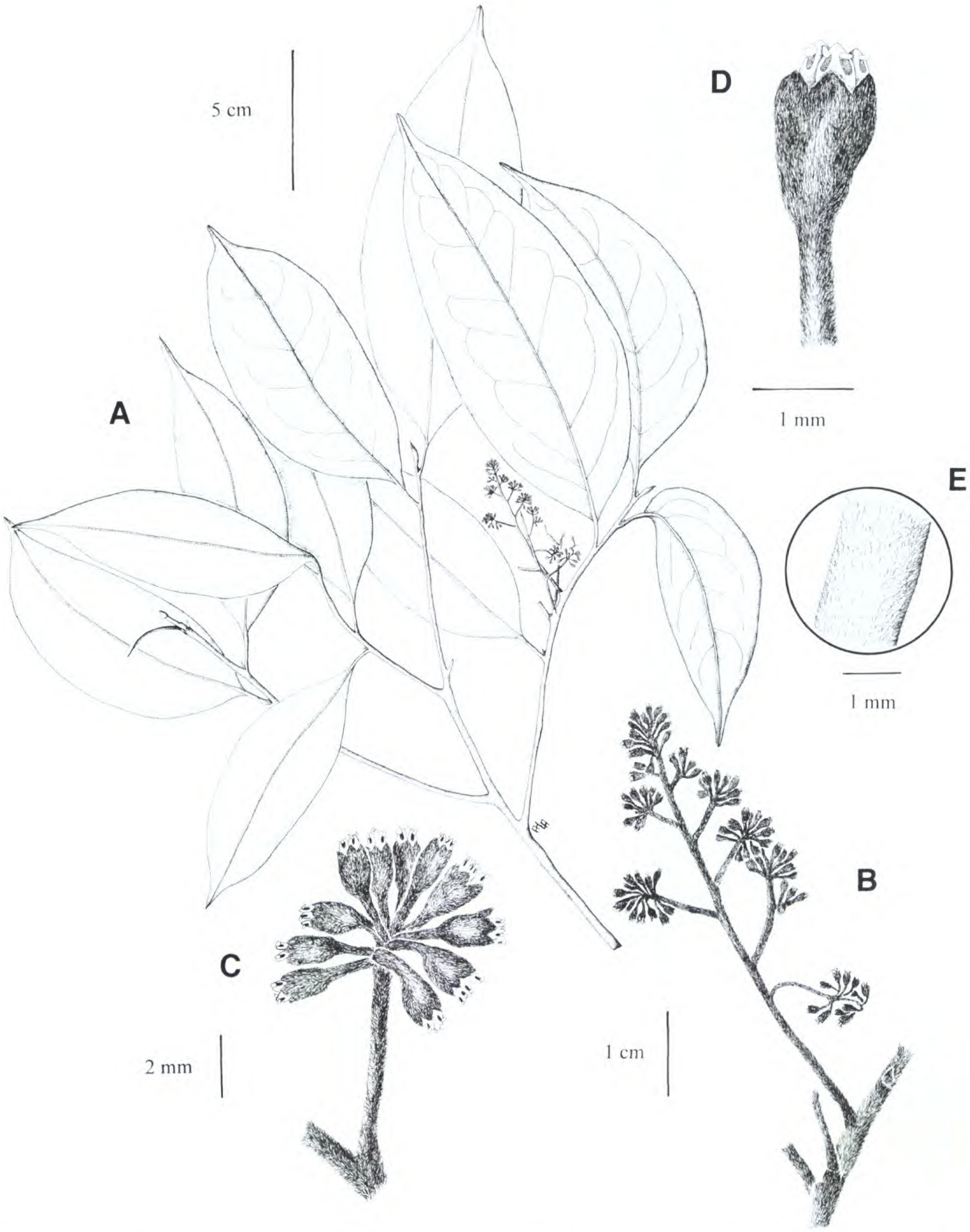


Figure 1. *Licaria aureosericea* van der Werff. —A. Habit. —B. Inflorescence. —C. Detail of inflorescence. —D. Flower. —E. Indument of young twig. (All from *Vicentini et al. 644*, isotype at MO.) Drawn by Alba L. Arbelaez.

on each side, arching upward and becoming loop-connected in the distal half, sometimes with a smaller, additional string of loops on top of the first one; domatia absent; petioles 8–15 mm long, flat above, with the same indument as the twigs. Inflorescences 2.5–6 cm, paniculate-cymose, the cymes sessile, one or several together and then the flowers in dense clusters, densely brown or golden brown tomentellous, the surface completely covered, in the axils of bracts or rarely in the axils of leaves.

Flowers perfect, cylindrical, 1.6–2.1 mm long, densely pubescent outside, the surface completely covered by the indument, brown or golden yellow, slightly constricted near the middle; tepals, measured from the point of constriction, ca. 1 mm long, united for most of their length, the free lobes 0.1–0.2 mm long, triangular, erect; stamens 3, 0.5–0.7 mm long, 2-celled, the cells extrorse, opening toward the tip, anthers exserted at anthesis, the filaments dorsally almost entirely pubescent, the anthers glabrous, glands present at the base of the filaments, sessile, flattened, only noticeable because of their dark color, or lacking; staminodia not seen; pistil 1.8 mm long, glabrous, the style twice as long as the slender ovary; receptacle glabrous or pubescent inside. Fruit and cupule unknown.

Phenology. Flowers: June, August, and September.

Habitat. Terra firme forest on clay soil.

Licaria aureosericea is characterized by the combination of alternate leaves, densely tomentellous twigs, cylindrical flowers with the anthers exserted and a dense, golden sericeous indument on the lower surface of the young leaves. The flowers are quite similar to those of *L. oppositifolia* (Nees) Kostermans, but that species has opposite or subopposite leaves, an appressed indument on the twigs, more pubescence on the upper leaf surface, and it lacks the golden sericeous indument on the leaves. Kurz (1983) only saw the Prance collection of *L. aureosericea* and included it in *L. oppositifolia*, noting that it differed in its alternate leaves. Additional recent collections have shown that this combination of alternate leaves, tomentellous twigs, and cylindrical flowers with exserted anthers is consistent and not restricted to collections from the Ducke Reserve, but also occurs elsewhere in Amazonian Brazil and in Guyana. The type specimen comes from a marked tree (1755-06), which hopefully will facilitate collecting fruiting material. The three collections from Guyana have a pubescent inner surface of the receptacles, while the Brazilian collections have a glabrous receptacle.

Paratypes. BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke (fl), *Martins et al. 16* (G, INPA, K, MBM, MG, MO, SP, U, UB), (fl), *Prance et al. 9035* (INPA, NY); São Gabriel da Cachoeira, Morro dos Seis Lagos, 0°20′N, 66°45′W, 400 m (fl), *Nelson et al. 2346* (INPA, MO). GUYANA. **U. Takutu-U. Essequibo region:** Sipu River, 01°25′N, 58°57′W (fl), *Clarke et al. 7825* (MO, US); Acarai Mts., 01°22′N, 58°60′W, 700 m (fl), *Clarke et al. 7242* (MO, US), (fl), *Clarke et al. 7602* (MO, US).

Licaria hirsuta van der Werff, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W, 30 June 1993 (fl), *J. E. L. S. Ribeiro et al. 950* (holotype, INPA; isotypes, MO, SP). Figure 2.

Ad subgenus *Licariam* pertinens, a congeneris foliis alternis, pinnatinervibus subtus pilis erectis praeditis recedit.

Trees, to 15 m. Twigs terete or roundly angled, densely tomentose-hirsute, the surface of the twigs completely covered by the yellowish brown indument, this turning darker with age; terminal buds densely tomentose-hirsute. Leaves alternate, 7–18 × 3–6 cm, chartaceous, (narrowly) elliptic; apex (shortly) acuminate, the acumen 0.5–2 cm long; the base acute to angustate; the upper surface glabrous; the lower surface papillose, moderately erect pubescent, the surface largely visible, the indument denser along the major veins and midrib and covering these completely; midrib and lateral veins immersed or slightly impressed on the upper surface, raised on the lower surface; tertiary venation raised on lower, not visible on upper surface; lateral veins 5 to 7 on each side, arching upward near the margin and becoming loop-connected; domatia absent; petioles 6–12 mm long, canaliculate, with the same indument as the twigs. Inflorescences in the axils of bracts at the base of recent shoots or along leafless short shoots, 4–10 cm long, paniculate-cymose, densely pubescent. Flowers perfect, about twice as long as the pedicels, densely pubescent, turbinate, ca. 2 × 2 mm; tepals much shorter than the floral tube, broadly triangular, erect or incurved; the stamens included with only their tips with the anther cells visible; stamens 3, 2-celled, representing whorl III, the filaments densely pubescent, the cells apical and opening toward the center of the flower; staminodes representing whorls I and II present, glabrous or pubescent, sometimes with a glandular tip; glands present at the base of the stamens; pistil ca. 1.5 mm long, pubescent; the receptacle deeply urceolate, densely pubescent inside. Fruit unknown; cupule 1.5 × 2 cm, warty, deeply cup-shaped, with a double margin, the inner margin short, erect, without remnants of the stamens.

Phenology. Flowers: June and August.

Habitat. Terra firme forest on clay soil.

Licaria hirsuta can be readily recognized by the erect indument on lower leaf surfaces and along the twigs. No other *Licaria* species from Amazonian Brazil has such a hirsute indument. The papillose lower leaf surface is also a good character; it has been reported only in *L. chrysophylla* (Meisner) Kostermans (which has opposite leaves), *L. dolichantha* Kurz (which has flowers 3–6 mm long),

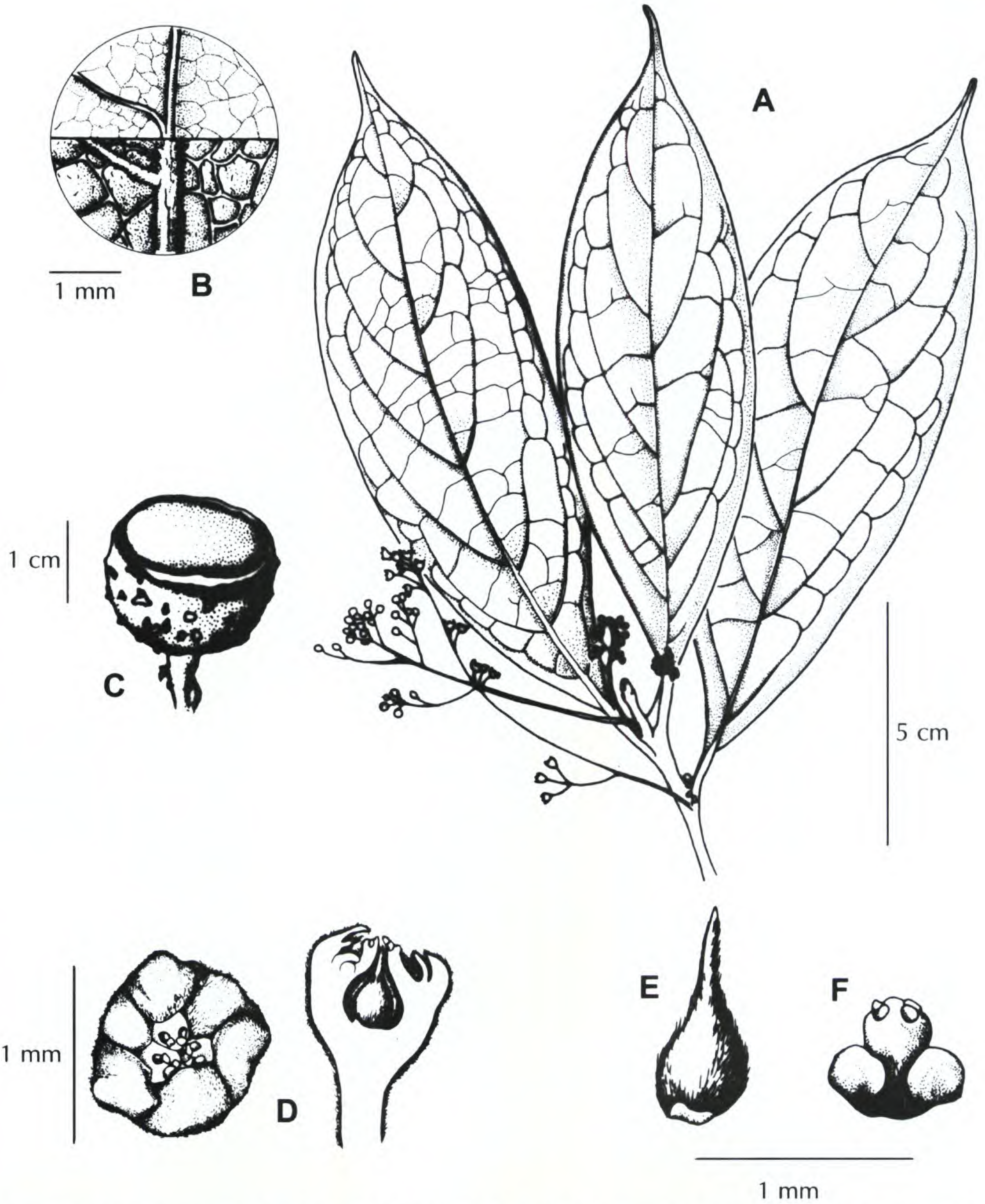


Figure 2. *Licaria hirsuta* van der Werff. —A. Habit. —B. Details of the upper (at top) and lower leaf surface. —C. Fruit cupule. —D. Flower. —E. Pistil. —F. Stamen. (C from *Pires & Lima 66*, otherwise from holotype, *Ribeiro et al. 950*.) Drawn by Angelic Katz Nara.

and *L. brasiliensis* (Nees) Kostermans (which has an appressed indument); these three species are all known from the Amazonian lowlands. Two species from Venezuelan Guayana also have an erect indument, *L. tomentosa* van der Werff, a poorly known species that has opposite leaves, and *L. trinervis* van der Werff, which has small, tripliveined leaves. An unidentified *Licaria* specimen from Amazonas (Rio Maués-Açu), *Hill 13106* (INPA), also has erect hairs on the lower leaf surface, but differs in having somewhat tripliveined leaves, a sparser, shorter indument on the

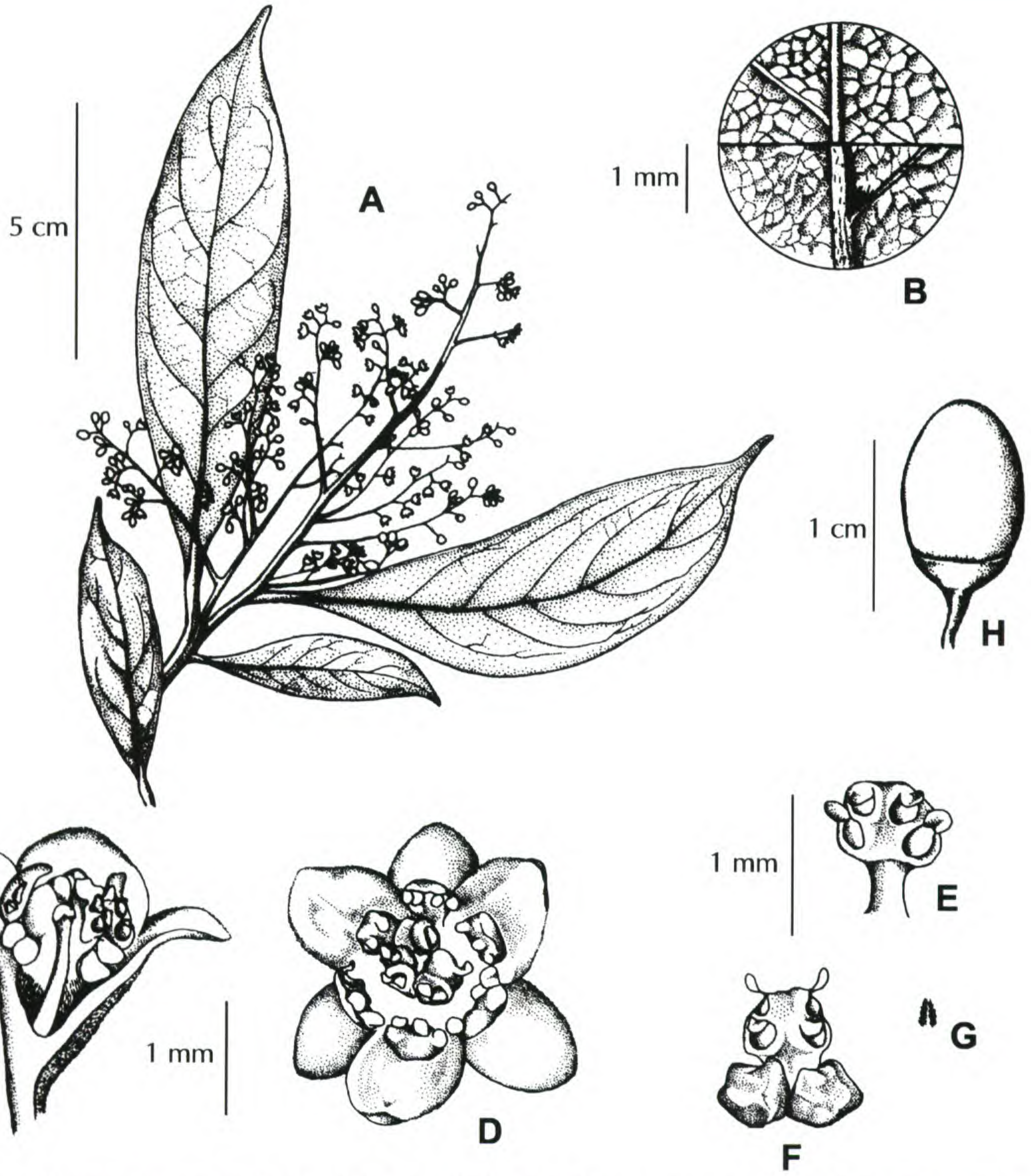


Figure 3. *Ocotea cinerea* van der Werff. —A. Habit. —B. Details of the upper (at top) and lower leaf surface. —C, D. Staminate flower. —E. Stamen of whorls I and II. —F. Stamen of whorl III. —G. Staminode of whorl IV. —H. Fruit. (A, B from holotype, *Nascimento et al. 742*; C–F from *Vicentini 826*; H from *Ribeiro 1127*.) Drawn by Angelic Katz Nara.

inflorescences and flowers, and a raised reticulation on the upper leaf surface. It probably represents an undescribed species, but more material is needed for its description.

Paratypes. BRAZIL. **Amazonas:** Manaus–Caracaraí road, km 115 (fl), *Prance et al. 21638* (INPA, MO, NY); km 137 (fr), *Pires & Lima 66* (INPA); km 69 (st), *Rodrigues & Chagas 1752* (INPA); Distrito Agropecuário da Suframa, Fazenda Esteio, Reserva 1301 of the Projeto Dinâmica Biológica de Fragmentos Florestais (PDBFF), 02°23′S, 59°51′W (fl), tree 1015, *Martins et al. s.n.* (INPA, MO).

Ocotea cinerea van der Werff, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W, 6 Feb. 1995 (fl), tree 801–06, *J. R. Nascimento et al. 742* (holotype, INPA; isotypes, MO, SP). Figure 3.

Ocoteae schomburgkianae similis, sed receptaculo florum masculorum intus pubescente, staminodiis parvis, pubescentibus, statura maiore et cupulis minus profundis recedit.

Dioecious trees, to 40 m. Twigs angular, when

young with some minute appressed hairs, soon becoming glabrous; terminal buds densely, whitish appressed pubescent. Leaves 5–11 × 1.8–4 cm, alternate, stiffly chartaceous, elliptic or elliptic-obovate, glabrous or nearly so; the apex obtuse or acuminate, the acumen to 1 cm long; the base acute or somewhat decurrent on the petiole; the margin flat or incurved near the base; midrib (slightly) raised, lateral veins and reticulation immersed on the upper surface, midrib and lateral veins raised, reticulation immersed, but visible due to its lighter color on the lower surface; lateral veins 5 to 7 on each side; domatia frequently, but not always present, inconspicuous, consisting of a few hairs or a slight depression; petioles 5–7 mm long, not always clearly distinct from the decurrent leaf bases. Inflorescences in the axils of normal leaves, 4–8 cm long, sparsely appressed pubescent, paniculate-cymose. Flowers unisexual. Male flowers glabrous or sparsely puberulous outside, ca. 5 mm diam.; tepals spreading, glabrous on the inner surface, ca. 2 mm long, broadly ovate-elliptic; stamens 9, all 4-celled, the outer 6 with the anther cells in 2 pairs, introrse, the anther about twice as long as the narrow filament, the inner three with free filaments, the cells extrorse-lateral, in 2 pairs; glands at the base of the inner stamens conspicuous, the two glands of each stamen slightly fused at the base; staminodia present, stipitiform, densely pubescent, about as long as or slightly longer than the glands; pistillode slender, 2 mm long, glabrous, the tip dark; receptacle rather deep, pubescent inside. Female flowers with 9 larger staminodia, representing the outer 3 whorls, these glabrous; staminodia of whorl IV stipitiform, small, pubescent; pistil glabrous, 1.5 mm long, the ovary ca. 1.2 mm long; receptacle urceolate, glabrous inside. Fruits 1–1.5 × 0.8–1.0 cm, ellipsoid, largely exserted from the shallow, bowl-shaped cupule, this 6–8 × 2–3 mm; the peduncle not or scarcely swollen and abruptly widened in the cupule.

Vernacular. Peru: "Moena negra." Brazil: "Louro-preto."

Phenology. Flowers: November, January, February, March, and April. Fruits: August, September, October, and November. *Ocotea cinerea* flowers every two years at the Reserva Florestal Ducke according to field observations by A. Vicentini and supported by the collection dates.

Habitat. Terra firme forest on clay to sandy-clay soil.

Ocotea cinerea is an inconspicuous species, best recognized by its almost glabrous, roundly angular twigs, which usually have a grayish color (hence the specific epithet), the elliptic-obovate or elliptic leaves with frequently an inrolled base and decurrent on the petiole, the pubescent receptacle of the staminate flowers, and the pubescent staminodia of whorl IV. In Rohwer's (1986) treatment it keys to *O. schomburgkiana* (Nees) Mez, which differs in its roundish twigs, elliptic to elliptic-ovate leaves, glabrous receptacle, and smaller size (*O. schomburgkiana* is a shrub or small tree, rarely exceeding 10 m, while *O. cinerea*, when fertile, ranges from 15 to 40 m). An additional difference is that the tertiary venation tends to be slightly raised on the upper leaf surface of *O. schomburgkiana*, while it is immersed in *O. cinerea*. Label data suggest that *O. schomburgkiana* predominantly occurs on white sand, while *O. cinerea* is usually found on clay or sandy-clay soil.

Paratypes. BRAZIL. **Amapá:** Mun. de Macapá, Cupixi, 0°32′N, 51°52′W (fl), *Rabelo et al. 3226* (MG, MO, NY); Mun. de Macapá, Estrada Perimetral Norte, 1°21′N, 53°15′W (buds), *Mori & Cardoso 17577* (MG, MO, NY). **Amazonas:** Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W (fl), *Rodrigues & Osmarino 8314* (INPA, MO), (fl), *Rodrigues & Osmarino 6869* (INPA, NY), *Rodrigues & Osmarino 6874* (INPA, NY), (fl), *Nascimento et al. 743* (INPA, MO, SP), (fl), *Nascimento et al. 749* (INPA, MO, SP), (fr), *Ribeiro et al. 1127* (INPA, MO, SP), (fl), *Vicentini et al. 803* (INPA, MO, SP), (fl), *Vicentini et al. 826* (INPA, MO, SP); Distrito Agropecuário da Suframa, Reserva 1501 (km 41) of the PDBFF project, 02°24′S, 59°43′W (buds), *Oliveira et al. A 512* (INPA, MO, NY), (fl), *Oliveira et al. A1917* (INPA, MO, NY), (fl), *Mori 22864* (INPA, MO, NY), (fr), *Mori & Mora Cardoso 20711* (INPA, MO, NY), (fr), *Mori et al. 20542* (INPA, MO, NY); Distrito Agropecuário da Suframa, Reserva 3304 of the PDBFF project, 2°22′S, 59°57′W (fr), tree 3118, *da Silva et al. s.n.* (INPA, MO); CEPLAC, km 29, Manaus–Itacoatiara Rd. (fl), *Pennington et al. P22757* (INPA, MO, NY); km 154, Manaus–Caracaraí Rd. (fr), *Prance et al. 22724* (INPA, MO, NY); km 26, Manaus–Caracaraí Rd. (buds), *Prance et al. 3069* (INPA, MO, NY); Mun. Presidente Figueiredo, UHE Balbina, (fl), *Cid Ferreira et al. 6618* (INPA, MO). FRENCH GUIANA. **Saül:** Sentier Botanique, 3°37′N, 53°12′W (fr), *Mori et al. 23734* (CAY, MO, NY), (fr), *Mori et al. 23898* (CAY, MO, NY), (fr), *Mori et al. 22712* (CAY, MO, NY), (fr), *Mori et al. 24691* (MO, NY). PERU. **Depto. Loreto:** Jenaro Herrera, 1 Oct. 1981 (young fr), *tree 2/216, sine coll., s.n.* (MO), (young fr), *tree 5/227, sine coll., s.n.* (MO), (fl), *Encarnación 26151* (MO), (young fr.), *Castillo 2* (MO).

Ocotea delicata Vicentini, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W, 5 May 1995 (fl), tree 2534–06, *A. Vicentini et al. 952* (holotype, INPA; isotypes, K, MG, MO, SP). Figure 4.

Ocoteae laxae et *O. tarapotanae* foliis subtriplinervibus, nervis parum impressis similis, foliis edomatiatis ramulisque dense tomentellis recedit.

Small tree, to 10 m. Branching presents contin-

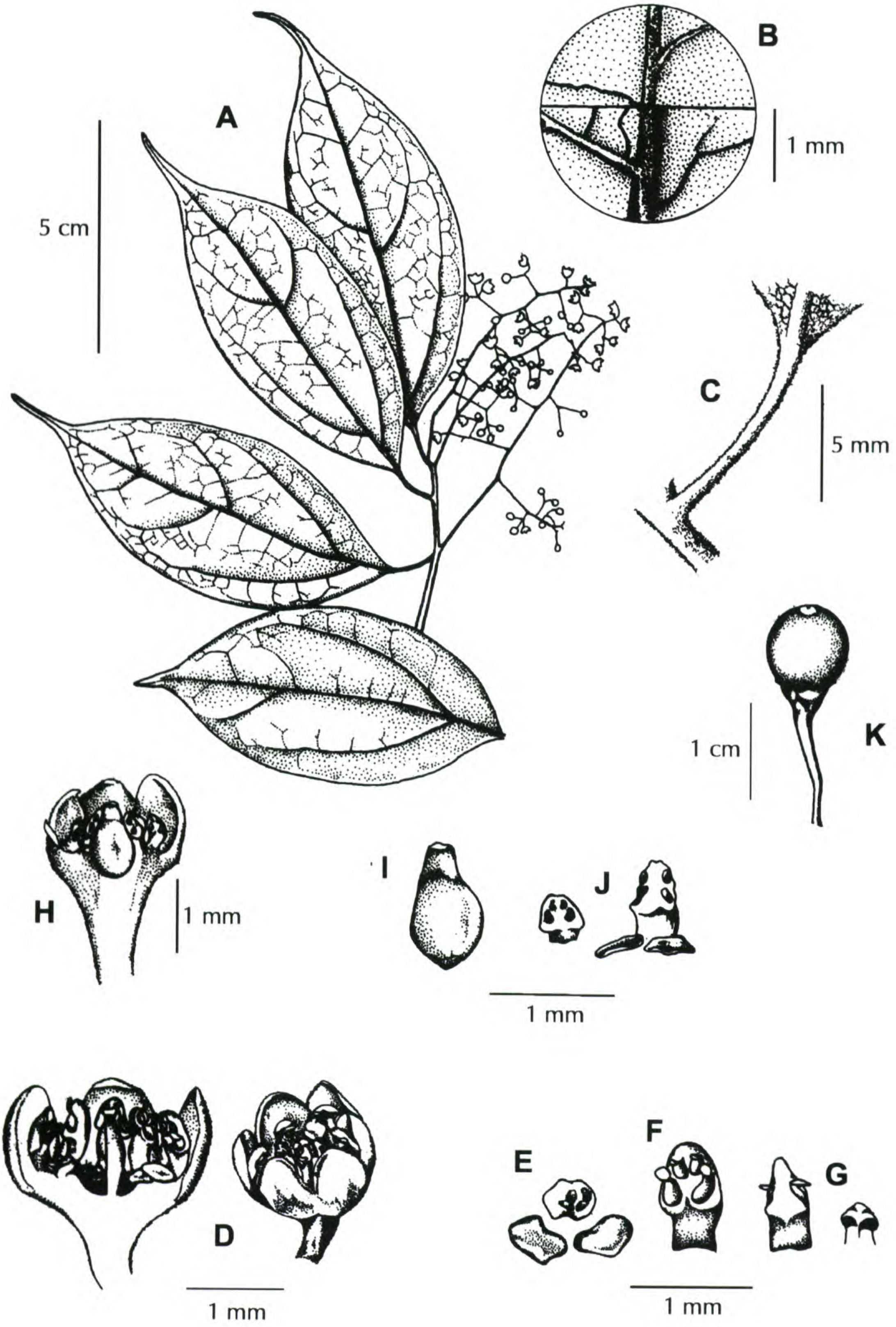


Figure 4. *Ocotea delicata* Vicentini. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Detail of the dense indument on the petiole. —D. Staminate flower. —E. Stamen of whorl III with lateral glands (upper

uous growth. Twigs subcylindrical, 1–1.5 mm diam. 5 cm below the terminal bud, completely covered by short light brown (grayish) erect hairs, slowly becoming sparse with age; terminal buds ca. 2 mm long, covered by the same erect indument. Leaves alternate, pseudo-distichous, evenly distributed in ± pendulous branches (field observation), 5–14 × 2–5.5 cm, chartaceous, elliptic; the apex caudate (acumen 7–18 mm long), rarely acute; the base acute with recurved margins; margins otherwise flat; lamina not clearly gland-dotted, usually drying dull green, the lower surface with short erect hairs on the venation, denser on the midrib and sparse to absent on the surface, persisting on mature leaves; midrib and secondary veins also pubescent on the upper surface of mature leaves, at least on the lamina base, midrib and secondary veins prominent on both surfaces; secondary veins 4 to 5 pairs, basal veins distinct, more acute arching and longer than rest, forming a sub-tripliveined venation, essentially all veins clearly loop-connected, but sometimes the basal ones free; tertiary veins slightly prominent beneath and inconspicuous above, ± perpendicular to midvein in the inner and lower half, elsewhere reticulate, or completely reticulate, the reticulation coarse; domatia absent; petiole 0.7–1.4 cm long, slender (ca. 1 mm thick), subcylindrical and completely covered by the same indument as twigs. Inflorescence in the axils of normal leaves, 4–10 cm long, paniculate-cymose, 2 or 3 orders of branching; branches ± perpendicular to the main branch; pedicels and distal internodes of cymes well developed, individual flowers clearly separate at the tips of inflorescence branches, pedicels with same short erect hairs as twigs, the indument dense and becoming sparser toward the flowers; bracts and bracteoles caducous at anthesis. Flowers unisexual, ca. 2 mm diam.; pedicels longer than flowers, 2–2.5 mm long, with erect hairs, sparse or dense but not completely covering the surface; all tepals equal, yellow, erect at anthesis, ovate, ca. 1.5 mm long, hyaline, pubescent on outer surface and almost glabrous inside. Staminate flowers with 9, 4-celled stamens (sometimes whorl IV also fertile, if so with 2 anther cells); outer 6 stamens ca. 0.8 mm long, filament ca. 0.4 mm long, glabrous, as wide as the anther's base, the cells introrse in two rows, completely filling the anther, upper ones smaller than the lower ones; inner 3 stamens ca. 0.8 mm long, the filaments as long as and slightly narrower than anthers, glabrous, anthers triangular, lower cells extrorse-latrorse, upper ones clearly latrorse, opening toward the connective, with two flattened glands at the base, shorter than filaments; whorl IV variable in flowers of the same inflorescence, completely absent, or stipitiform, sterile and pubescent, or fertile with only two anther cells, or with a glandular head, and sometimes also presenting glands at the base; pistillode glabrous with a conspicuous stigma, as high as inner stamens; the receptacle shallow, almost flat, and densely pubescent inside. Pistillate flowers with 9 staminodes, these ca. 0.2 mm long, filaments glabrous, with small flattened glands at the base of the inner 3; the pistil glabrous, ca. 1 mm long, the style shorter and almost indistinct from ovary, these half inside a pubescent receptacle, the stigma triangular. Fruits globose, ca. 1 cm diam.; cupule small, ca. 7 mm diam., shallow and with persistent tepals; pedicel claviform and ca. 1.5 cm long.

Phenology. Flowers: May and June. Fruits: August.

Habitat. Terra firme forest on clay soil.

Ocotea delicata is a small tree that can be easily recognized by its tripliveined leaves, slightly impressed major veins, and the densely tomentellous twigs and inflorescences. It shares with *Ocotea laxa* (Nees) Mez and *Ocotea tarapotana* (Meisner) Mez, both members of the *Ocotea cernua* group (sensu Rohwer, 1986), tripliveined leaves with slightly impressed major veins. However, these two species have glabrous or sparsely appressed pubescent twigs (the indument not obscuring the surface as in *O. delicata*), glabrous or almost glabrous flowers and inflorescence branches, and domatia in the axils of the lowermost lateral veins. These vegetative characters alone allow an easy distinction of these species. In addition, in staminate flowers of *O. laxa* and *O. tarapotana* the pistillode is reduced to absent or at least without a conspicuous stigma, and the glands of inner stamens are globose, not flattened as in *O. delicata.* The fruits and cupules of *Ocotea tarapotana* are not yet known; *O. laxa* has a fruit and cupule (with persistent tepals) similar to those of *O. delicata. Ocotea delicata* is only known from the vicinity of Manaus and toward the east until the Rio Trombetas, on the north side of the Amazon Basin.

Paratypes. BRAZIL. **Amazonas:** Manaus, Reserva

←

view). —F. Stamen of whorl I. —G. Stamen (left) and staminode of whorl IV. —H. Pistillate flower. —I. Pistil. —J. Staminodes of whorls I and III (right, note flattened glands). —K. Fruit. (A–G from holotype, *Vicentini et al. 952*; H–J from *Rodrigues & Osmarino 6935*; K from *Vicentini 658.*) Drawn by Angelic Katz Nara.

Florestal Ducke, 02°53′S, 59°58′W, *Santos & Lima 959* (INPA, K, MG, MO, SP), (fr), tree 1757-06, *Vicentini et al. 658* (INPA, K, MG, MO, SP), (fl), tree 1757-06, *Vicentini et al. 1186* (INPA, K, MG, MO, SP), (fl), *Rodrigues & Osmarino 6935* (MO, NY), (fl), *Ramos & Oliveira 730* (INPA). **Pará:** Oriximiná, Porto Trombetas, km 60 Road Mineração do Norte (fr), *Cid et al. 1888* (INPA).

Ocotea immersa van der Werff, sp. nov. TYPE: Peru. Depto. Loreto: Prov. Requena, Arboretum Jenaro Herrera, tree 4/36, *A. Castillo s.n.* (holotype, MO). Figure 5.

Ad gregem *Ocoteae minarum* pertinens, ab illis speciebus foliis edomatiatis, laevibus, apice rotundatis differt.

Trees, to 25 m. Twigs with rounded ridges, the apices densely and finely appressed pubescent, the indument light brown and covering the distal few cm completely but the twigs quickly glabrescent with age; terminal buds densely and finely appressed pubescent. Leaves 13–25 × 4.5–7 cm, alternate, evenly distributed along the twigs, (narrowly) obovate, firmly chartaceous; the apex obtuse or rounded; the base gradually narrowed and decurrent on the petiole; the margins frequently inrolled; very young leaves with some appressed hairs, but soon glabrous on both surfaces; upper surface with midrib, lateral veins, and tertiary venation immersed or faintly raised; lower surface with midrib raised, lateral veins and tertiary venation immersed or nearly so; lateral veins 5 to 8 on each side; domatia lacking; petioles not distinct from the decurrent leaf bases, flat on the upper side, appressed pubescent when young, glabrescent with age. Inflorescences in the axils of normal leaves, 10–20 cm long, paniculate-cymose, minutely puberulous, the indument becoming denser toward the flowers. Flowers hermaphrodite or unisexual, 4.0–4.5 mm diam.; the tepals spreading at anthesis, elliptic-ovate, ca. 2 mm long, very sparsely puberulous outside, inner 3 tepals densely pubescent inside, outer 3 moderately pubescent inside. Hermaphrodite flowers with 9, 4-celled stamens; the outer 6 ca. 1 mm long, the filament ca. 0.2 mm long, pubescent, the anther rectangular, glabrous, with the introrse cells in two rows; the inner 3 stamens ca. 1.2 mm long, the filament ca. 0.4 mm long, with a few hairs, the anther glabrous, the cells lateral-extrorse, in 2 rows; the inner 3 stamens with 2 small glands at the base; staminodia not seen; pistil 1.5 mm long, with a few small, appressed hairs and a distinctly swollen base; receptacle shallow, densely pubescent inside. Pistillate flowers with 9 staminodia, these ca. 0.5 mm long, the cells not opening, filaments ± pubescent, glands present at the base of the inner 3 stamens; pistil glabrous, ca. 1.5 mm long, the stigma distinct, papillose; receptacle shallow, glabrous inside. Fruits ellipsoid, 2 × 1.4 cm; cupule a small plate (ca. 6 mm diam.) on a thickened pedicel.

Vernacular. Peru: "Palta moena."

Phenology. Flowers: July, November, and December. Fruits: December.

Habitat. Campinarana forest on white-sand soil.

Ocotea immersa belongs to the *O. minarum* group of Rohwer (1986) because of its small, plate-like cupule and thickened pedicel in fruit, its seemingly hermaphrodite and pistillate flowers, and the long, slender terminal buds with dense, appressed pubescence. Within this group it stands apart by its leaves with a rounded or obtuse apex, the absence of domatia, and its immersed venation. Only one other species, *O. obovata* (Ruiz & Pavón) Mez, has a rounded leaf apex and lacks domatia, but that species occurs in the Peruvian Andes and has clearly raised venation (in the original description its leaves are described as venosissima). Other useful characters for *O. immersa* are its glabrous leaves, the finely appressed pubescence on the young twigs, the dense pubescence on the inner surface of the tepals, and the pubescent receptacle of the hermaphrodite flowers, while pistillate flowers have a glabrous receptacle.

In describing this species as having both hermaphrodite and pistillate flowers I follow Rohwer (1986). Whether the flowers with functional stamens are really hermaphrodite is still not clear. These flowers possess a pistil with a clearly swollen base, suggesting the pistil is functional. In most *Ocotea* species with unisexual flowers the staminate flowers either lack a pistillode or the pistillode is very slender to thread-like and does not have a swollen base. The two collections with young fruits have a few staminodia attached to the cupule, and have the inside of the receptacle glabrous, indicating these fruits developed from pistillate flowers. Therefore, it remains to be demonstrated that fruits develop from the flowers which I describe here as hermaphrodite. The fruiting collection from the Reserva Florestal Ducke (*Vicentini et al. 784*) has irregularly swollen, corky pedicels, which are partly hollow. This seems to be a result of a fungal infection. The collection *Vasquez et al. 1012* has non-diseased fruits and pedicels; it was used in making the description.

Paratypes. BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W (fr), *Vicentini et al. 784* (INPA, MO, SP), (fl), *Vicentini et al. 798* (INPA, MO, SP), (fl), *Vicentini et al. 1225* (INPA, MO, SP). PERU.

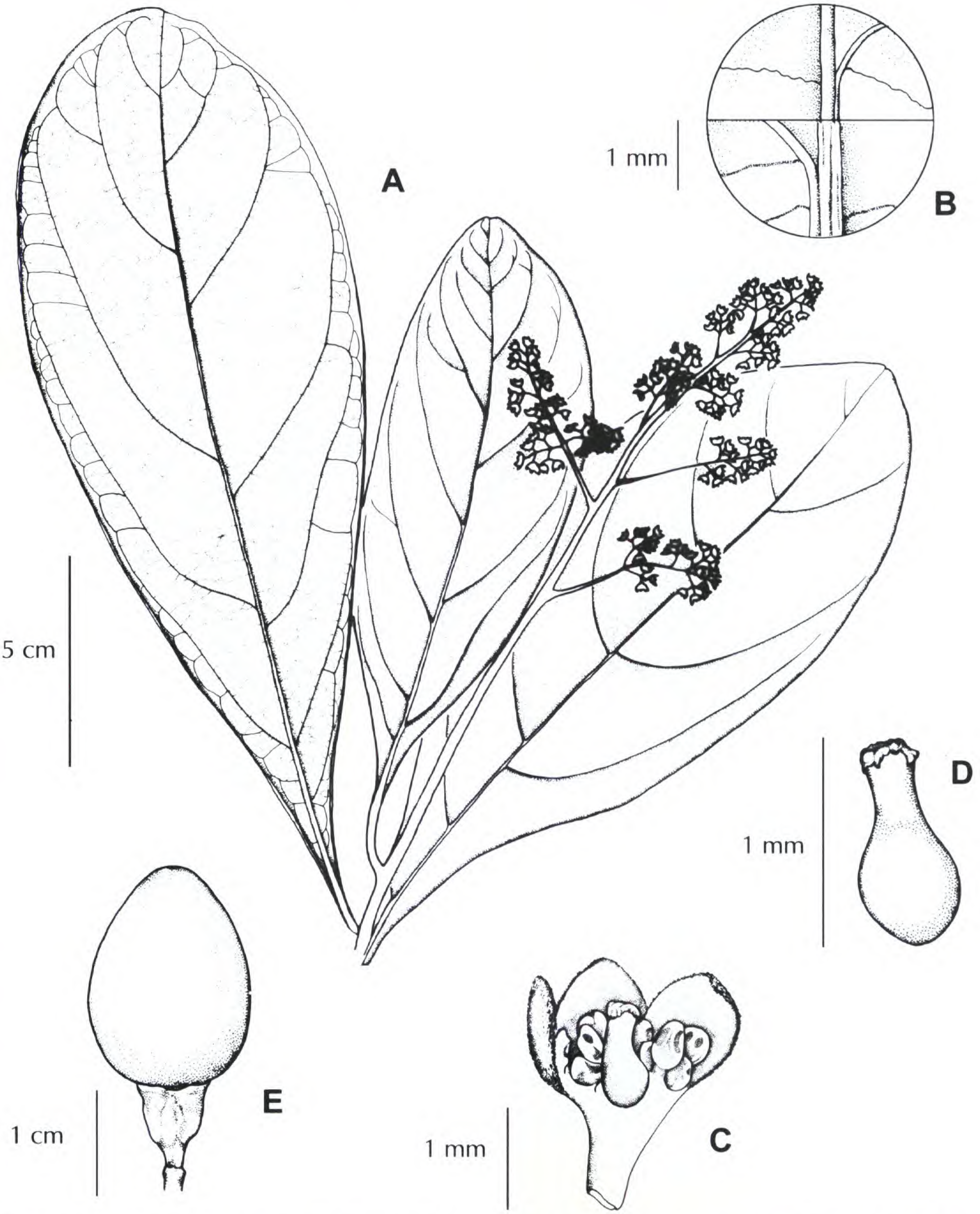


Figure 5. *Ocotea immersa* van der Werff. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Longitudinal section of a pistillate flower. —D. Pistil. —E. Fruit. (A–D from *Vicentini 798*; E from *Vazquez 1012*.) Drawn by Angelic Katz Nara.

Depto. Loreto: Prov. Requena, Arboretum Jenaro Herrera, 4°50′S, 73°45′W, without date (fr), tree 5/43, *sine coll., s.n.* (MO), (buds), *sine coll., s.n.* (MO), (fl), tree 4/36, *A. Castillo s.n.* (MO), (fr), *Grández & Aguilar 6041* (MO), (fr), *Vasquez et al. 1012* (MO), (young fr), *van der Werff et al. 9965* (MO), (young fr), *van der Werff et al. 10041* (MO), (fl & young fr), *van der Werff et al. 10097* (MO).

Ocotea ligulata van der Werff, sp. nov. TYPE: Brazil. Amazonas: Distr. Agropecuário, Reserva 1501 (km 41) of the WWF/INPA MCS Project, 6 Dec. 1988 (fl), *S. Mori et al. 20190* (holotype, MO; isotypes, INPA, NY). Figure 6.

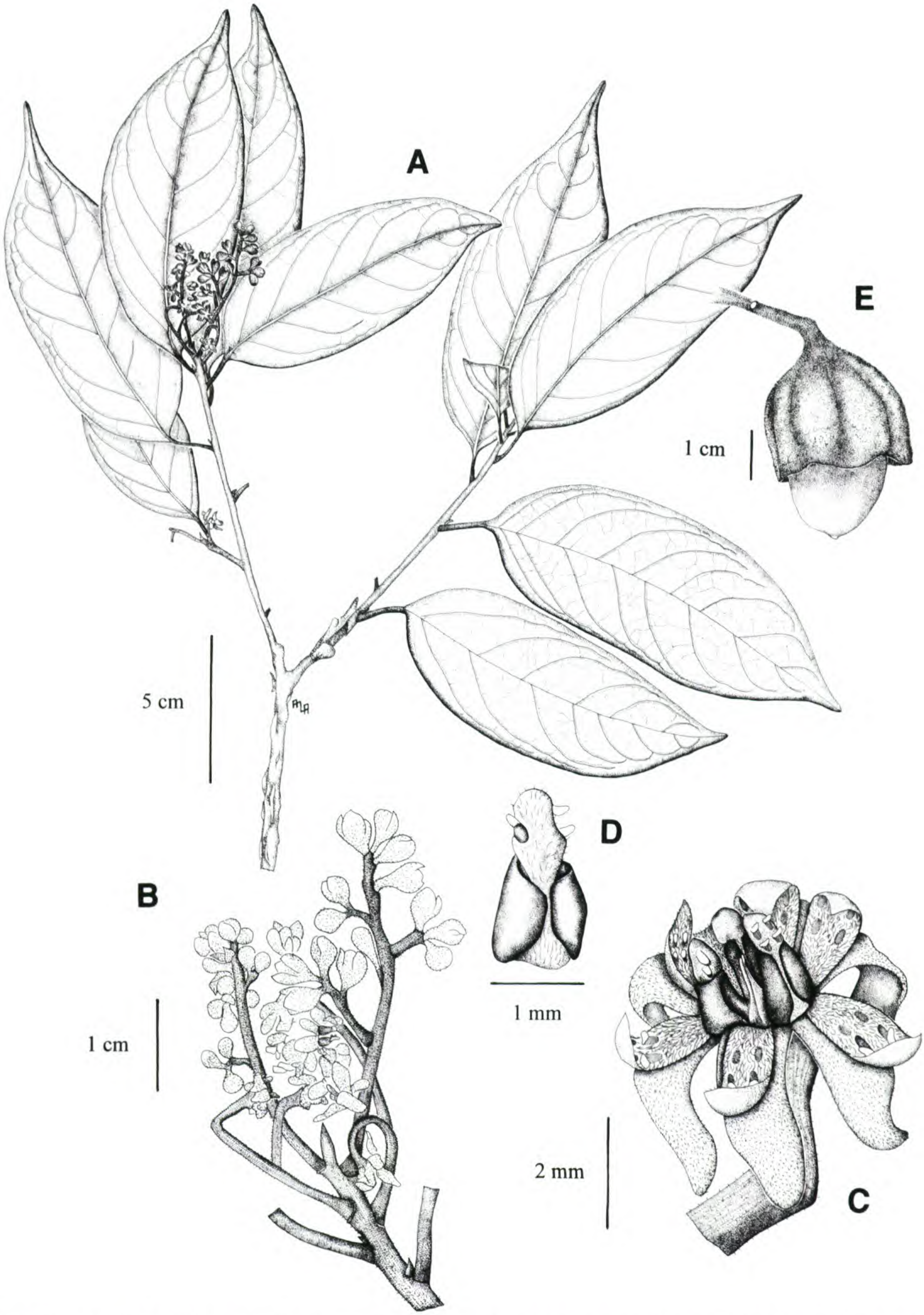


Figure 6. *Ocotea ligulata* van der Werff. —A. Habit. —B. Inflorescences near tip of twig. —C. Flower. —D. Stamen of whorl III with large glands. —E. Cupule with fruit. (A–D from *Mori 20190*; E from *Mori 20574*.) Drawn by Alba L. Arbelaez.

Ocoteae cymbarum affinis sed floribus dense pubescentibus, cupula profunda, simplici-marginata recedit.

Trees, to 35 m. Twigs angular-ridged, the very tip sparsely appressed pubescent, but very soon becoming glabrous, solid; terminal buds rather sparsely appressed pubescent. Leaves 8–13 × 3–4.5 cm, elliptic or elliptic-oblong, alternate, stiffly chartaceous; apex acute or somewhat acuminate; base acute to obtuse; leaves glabrous; midrib weakly raised on upper surface, raised on lower surface; lateral veins and tertiary venation immersed on both surfaces, tertiary venation forming a fine reticulum, this and the lateral veins lighter in color than the laminae; lateral veins 6 to 8 on each side, poorly visible; domatia lacking; petioles 1–1.5 cm long, darker than the twigs, canaliculate, glabrous. Inflorescences to 5 cm long, paniculate-cymose, in the axils of bracts near the tips of the branches, moderately pubescent near the base, more densely so toward the flowers, the hairs ascending. Flowers hermaphrodite, 7–9 mm diam., greenish yellow; tepals ca. 3.5 mm long, elliptic-ovate, spreading to reflexed at anthesis, the outside completely covered by a gray-brown indument, the inside moderately papillose but the very base pubescent; stamens 9, 4-celled; the outer 6 ca. 2 mm long, tongue-shaped, somewhat narrowed near the base but without a distinct filament, the sterile tip ca. 0.5 mm long, papillose and with some hairs near the base, the cells introrse and arranged in 2 pairs; the inner 3 stamens slender, ± columnar, ca. 2 mm long, the anthers ca. 0.8 mm long, papillose, the cells lateral in 2 pairs, the filament covered by the large (1.2 mm long) glands; staminodia 3, stipitiform, ca. 0.6 mm long, densely pubescent; pistil ca. 2.5 mm long, glabrous; receptacle deeply cup-shaped, glabrous inside. Fruits ellipsoid, ca. 2 × 1.5 cm, purple at maturity; cupule deeply cup-shaped, 2.5 × 2.5 cm, with a single margin, enclosing half or more of the fruit.

Phenology. Flowers: December. Fruits: July.

Habitat. Terra firme forest on clay soil.

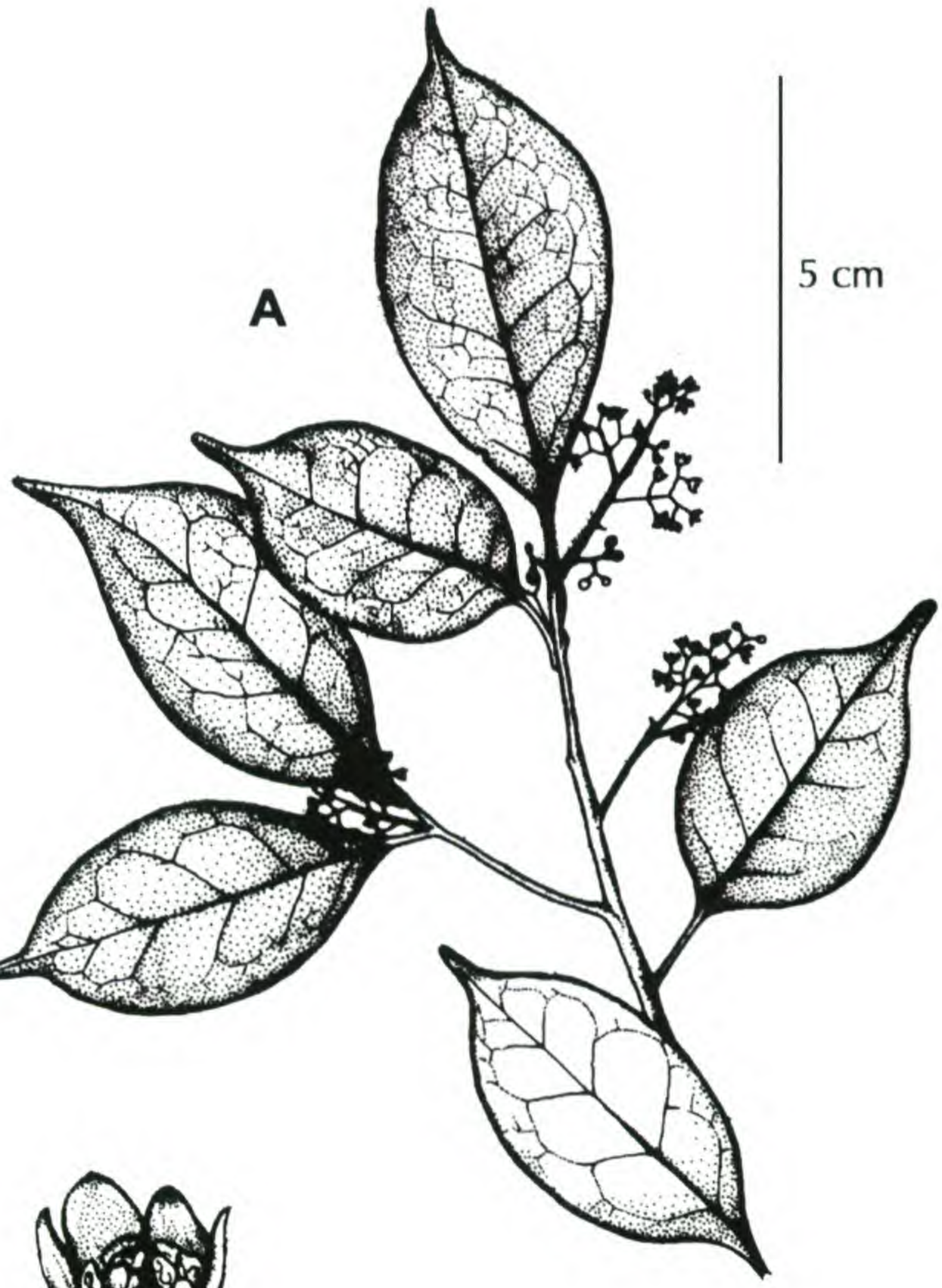
The ligulate stamens with a sterile tip place *Ocotea ligulata* in the subgenus *Dendrodaphne* (Beurling) Mez, a small group of less than 10 known species. Additional characters of this subgenus, not present in all species, are the position of the inflorescences in the axils of bracts, the presence of a cupule with a double margin, the papillose indument on the stamens and inner surface of the tepals, and the dark color of the petioles in dried specimens, usually darker than the twigs. Three of the species belonging to this subgenus are relatively common, *O. dendrodaphne* Mez and *O. veraguensis* (Meisner) Mez from Central America and *O. cymbarum* HBK from the lowlands of Venezuela, Colombia, and Brazil. A few species are rarely collected, *O. fragrantissima* Ducke from Amazonian Brazil, *O. quixos* (Lamarck) Kostermans from eastern Ecuador, *O. staminea* (Grisebach) Mez from Jamaica, and the recently described *O. morae* Gomez-Laurito from Costa Rica. Vegetatively, *O. ligulata* most resembles *O. cymbarum* and *O. quixos*. The latter two species differ in having sparsely pubescent flowers with part of the outer surface of the tepals always visible and in their different cupules. *Ocotea cymbarum* has a shallow, funnel-shaped cupule, this becoming plate-like at maturity with a double margin (the inner and outer margin have the same length), while *O. quixos* has a funnel-shaped cupule with the outer margin up to 1 cm longer than the inner margin. Twigs and leaves of *O. quixos* have a strong smell of cinnamon, which is lacking in *O. cymbarum* and *O. ligulata*. *Ocotea cymbarum* frequently has hollow twigs (especially older twigs) and occurs in flooded forest, whereas *O. ligulata* has solid twigs and is only known from terra firme forest. *Ocotea rhynchophylla* (Meisner) Mez has a small sterile tip of the stamens and can be confused with *O. ligulata*, but differs in having glabrous stamens (papillose in *O. ligulata*), a smaller cupule (1.5 × 1.5 cm vs. 2.5 × 2.5 cm), and spreading to half-erect (vs. reflexed) tepals. *Ocotea ligulata* is only known from the vicinity of Manaus. The two Mori collections were previously determined as *Aniba rosaeodora* Ducke and *Ocotea aciphylla* (Nees) Mez and may have been distributed under those names.

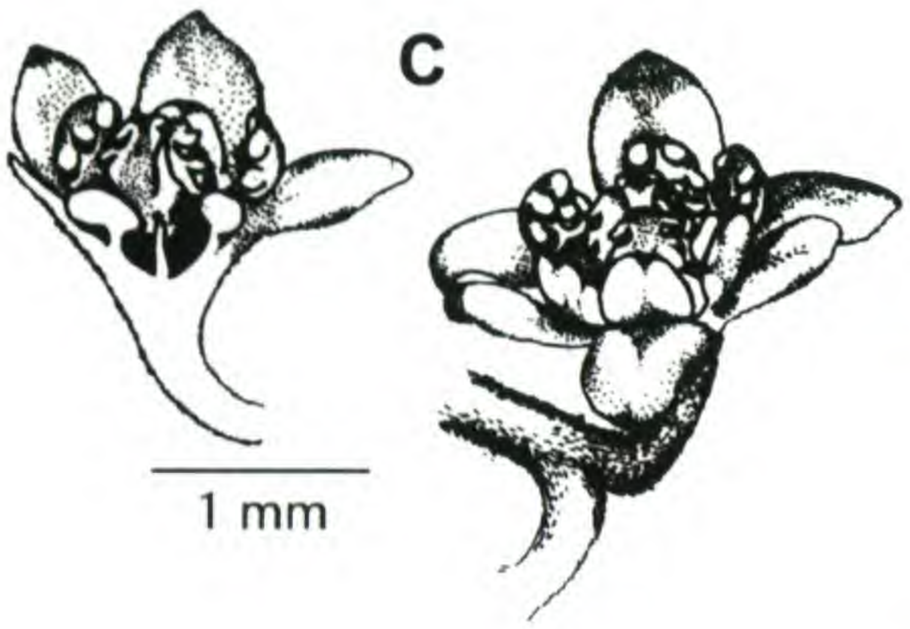
Paratypes. BRAZIL. **Amazonas:** Distrito Agropecuário, Reserva 1501 (km 41) of the PDBFF project, 2°24′S, 59°43′W (fr), *Mori et al. 20574* (MO, NY), Fazenda Porto Alegre, Reserva 3402, tree 637 (fr), *Dick 133* (MO, NY).

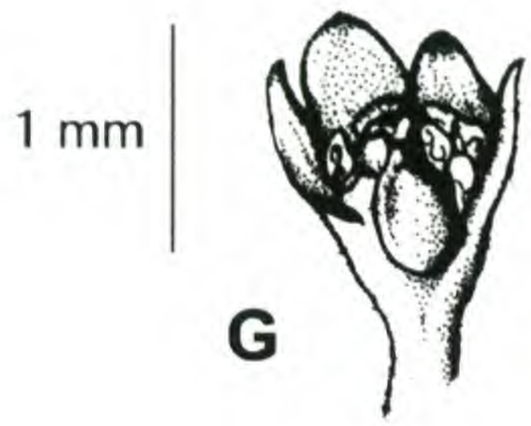
Ocotea minor Vicentini, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W, 3 Apr. 1997 (fl), tree 1211–06, *P. A. C. L. Assunção et al. 485* (holotype, INPA; isotypes, MO, SP). Figure 7.

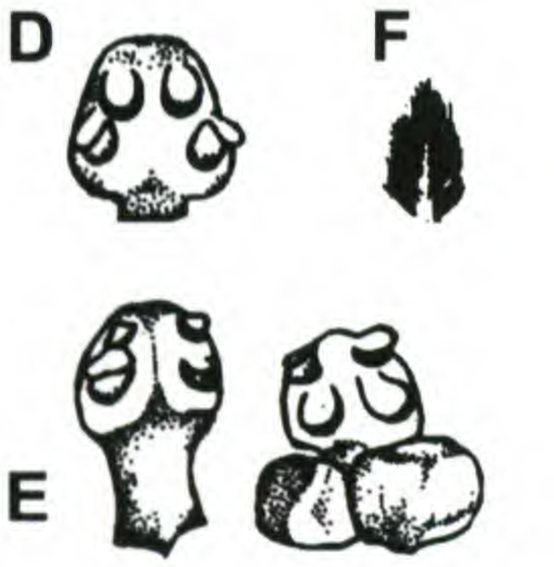
Ad gregem *Ocoteae cernuae* pertinens et *Ocoteae pauciflorae* affinis, sed inflorescentiis multifloris foliisque domatiis praeditis recedit.

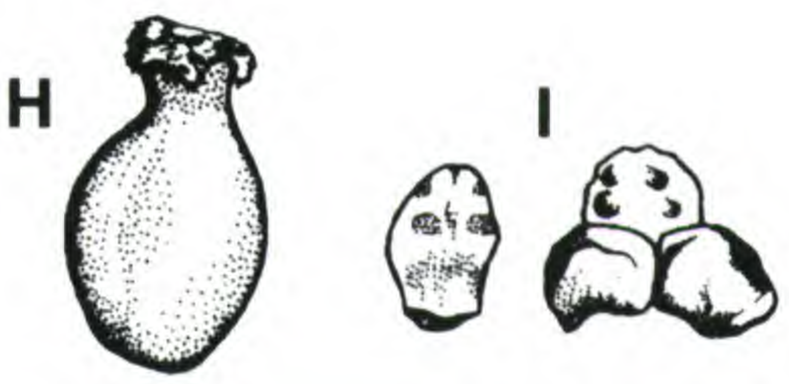
Dioecious trees to 20 m. Branching presents continuous growth. Twigs initially angular, soon becoming cylindrical, 1.5–2 mm diam. 5 cm below terminal bud, with extremely short appressed hairs, indument light brown, moderate, becoming sparse with age; terminal buds completely covered by longer appressed hairs. Leaves alternate, evenly dis-











1 mm

Figure 7. *Ocotea minor* Vicentini. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Staminate flower. —D. Stamen of whorl I. —E. Stamen of whorl III (left, with glands removed). —F. Staminode of whorl IV. —G. Pistillate flower. —H. Pistil. —I. Staminodes of whorls I and III. —J. Fruit. (A–F from holotype, *Assunção 485*; G–I from *Loureiro et al. s.n.*; J from *Assunção 662.*) Drawn by Angelic Katz Nara.

tributed along branches, 4–9 × 1.2–2.7 cm, firmly chartaceous, usually obovate; the apex caudate (acumen 7–17 mm); the base narrowly attenuate and flat beneath; the margins flat; lamina not clearly gland-dotted, glabrous or nearly so, usually drying dull grayish on the upper and light brown on the lower surfaces, not waxy; midrib prominent on both surfaces, more clearly on the upper one; secondary veins 5 to 7 pairs, all veins loop-connected at ca. 2 mm from margins, essentially straight but most basal ones evenly arching and more acute, slightly prominent on both surfaces; tertiary vena-

tion randomly reticulate, slightly raised beneath and almost inconspicuous above, the reticulation coarse; domatia consisting of small depressions, these sometimes with a hairy margin; petiole 0.6–0.7 cm long, sulcate, same color as stem, with sparse appressed hairs. Inflorescences in the axils of normal leaves, 1–5 cm long, 3 orders of branching; peduncle and lateral branches with patent hairs, the indument dense but leaving surface visible and becoming sparser toward flowers; bracts and bracteoles caducous at anthesis. Flowers unisexual, ca. 2–3 mm diam.; pedicels as long as flowers, ca. 1–1.5 mm long, with sparse appressed hairs; tepals equal, cream, erect at anthesis, narrowly ovate, ca. 1 mm long, glabrous on both surfaces. Staminate flowers with 9, 4-celled stamens; the outer 6 ca. 0.7 mm long, filament ca. 0.2 mm long, glabrous, distinctly narrower than anthers, and partially fused with tepals, anthers widely ovate, glabrous, with introrse cells in two rows, the connectives flat, not extended beyond cells; inner 3 stamens ca. 0.7 mm long, filaments as long as and slightly narrower than anthers, with a few hairs at the base, anthers rectangular, glabrous, lower cells introrse, upper ones latrorse or ± apical, then opening toward the connective, the connectives flat, not extended beyond cells, with two reniform glands at the base, these as long as filaments; staminodes of whorl IV absent, pistillode pubescent with a blackish but not well developed stigma; receptacle shallow, densely hairy inside. Pistillate flowers with 9 staminodes (those of whorl IV sometimes also present, stipitiform and hairy), these ca. 0.5 mm long, filaments glabrous, inner ones with two glands at the base; pistil glabrous, ca. 1 mm long, style shorter and almost indistinct from ovary, these half inside a pubescent receptacle, stigma distinct, 3-lobed, and papillose. Fruit ellipsoid, ca. 1 × 0.6 cm; the cupule shallowly cup-shaped, smooth, with a single margin, ca. 5 mm high × 6 mm wide.

Phenology. Flowers: March and April. Fruits: September.

Habitat. Terra firme forest on sandy-clay soil.

Ocotea minor is similar to *Ocotea cinerea*, and the two species can be separated in the following way: *O. minor* has a pubescent pistillode, erect tepals at anthesis, small flowers (up to 3 mm diam.), and the filaments of the outer 6 stamens partly fused with the tepals; on the other hand, *O. cinerea* has a glabrous pistillode, spreading tepals at anthesis, larger flowers (4.5 mm diam.), and the filaments of the outer 6 stamens free. *Ocotea cinerea* also often has slightly obovate leaves, which are a little larger than the elliptic leaves of *O. minor*. *Ocotea minor* shares with the *O. cernua* group (sensu Rohwer, 1986) filaments of the outer 6 stamens that are partly fused with the tepals. Although species delimitation within the *O. cernua* group is problematic (Rohwer, 1986), *O. minor* most closely resembles *O. pauciflora* (Nees) Mez of the species in this group. *Ocotea pauciflora* differs from *O. minor* in its few-flowered inflorescences, somewhat nodding flowers, and the absence of domatia. *Ocotea minor* is known from the central and eastern Amazon basin in Brazil.

Paratypes. BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W (fr), tree 821-06, *Assunção et al. 662* (INPA, MO, SP), (fl), tree 821-06, *Ribeiro et al. 1889* (INPA, MO, SP), (fl), *Rodrigues & Osmarino 6887* (INPA, NY), (st), *Gentry & Nelson 69094* (INPA, MO); Manaus–Itacoatira road, km 145 (fl), *Loureiro et al. s.n.* (INPA 35846) (INPA). **Maranhão:** Sta. Luiza, Bom Jesus on BR 222, Fazenda Batuta, km 2 (fl), *Taylor et al. E1181* (MG, MO, NY); Fazenda Agripec (Varig Airlines), 7 km W of Buriticupu on BR222 (buds), *Taylor et al. E1140* (MG, MO, NY).

Ocotea nigrescens Vicentini, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W, 2 Dec. 1964 (fl), *W. Rodrigues & Osmarino 6767* (holotype, INPA; isotype, NY). Figure 8.

Ocoteae bofo et *O. rubrinervis* similis, sed foliis glabris, non glandulo-punctatis, tepalis post anthesin deciduis recedit.

Tree up to 30 m tall. Twigs angular, soon becoming cylindrical, ca. 2 mm diam. 5 cm below terminal bud, with extremely short erect hairs (minute, the orientation not evident), the indument moderate to sparse, minute, leaving surface visible and glabrescent, the surface smooth and usually drying blackish; terminal bud completely covered by appressed hairs. Leaves alternate, evenly distributed along twigs, 7–16 × 2.5–6.5 cm, ca. 2 times longer than wide, rigid chartaceous, broadly elliptic to ovate; the apex acuminate, ca. 1–1.6 cm long; the base obtuse, rounded to cuneate; the margin flat or only at the base slightly recurved; lamina not clearly gland-dotted, glabrous or nearly so, the upper surface usually drying dull blackish with whitish reticulation and veins; midrib above slightly prominent, becoming flat toward the base, strongly prominent beneath; secondary veins 4 to 7 pairs, penninerved, evenly arching, the basal pairs longer, diverging more acutely from midrib than rest, all loop-connected in the distal part of lamina, the two most basal pairs closer together than rest, above slightly raised and strongly prominent beneath; tertiary venation reticulate and slightly raised be-

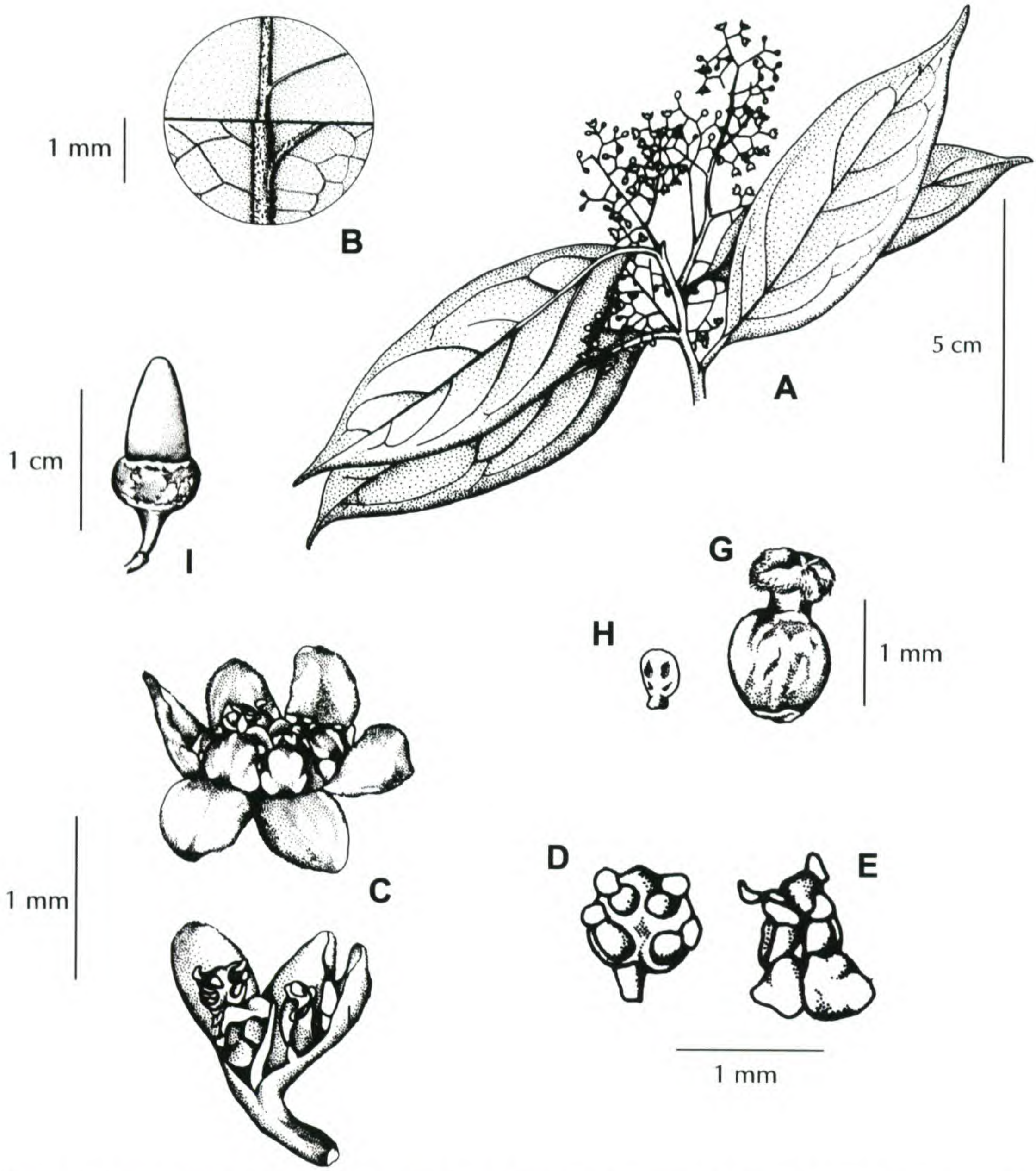


Figure 8. *Ocotea nigrescens* Vicentini. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Staminate flowers. —D. Stamen of whorl I. —E. Stamen of whorl III. —G. Pistil. —H. Staminode of a pistillate flower. —I. Fruit. (A, B, and G, H from *Assunção 418*; C–E from *Aluíso 237*; I from *Assunção 520.*) Drawn by Angelic Katz Nara.

neath, but more conspicuous above; domatia consisting of tufts of whitish hairs, present in the axils of most secondary veins, rarely absent; petiole 0.6–1 cm long, deeply canaliculate to infolded, with the same minute indument as twigs, sparser and soon glabrous. Inflorescences 1.5–7 cm long, borne in the axils of normal leaves, 2 to 3 orders of branching; peduncles and branches with minute erect (or crisped) whitish to yellowish hairs, indument dense but leaving surface visible; bracts and bracteoles caducous at anthesis. Flowers unisexual, ca. 2–3 mm diam.; pedicels as long as or shorter than flowers, ca. 1–1.5 mm long, with sparse minute erect hairs; tepals equal, white, erect at anthesis, ca. 1.2 mm long, glabrous or nearly so on both surfaces. Staminate flowers with 9, 4-celled stamens; the outer 6 ca. 0.8 mm long, filament ca. 0.2 mm long, glabrous, narrower and shorter than anthers, these

glabrous and with introrse cells in two rows, the connective not extended, flat or shortly apiculate; the inner 3 stamens ca. 0.8 mm long, filaments glabrous, narrower and shorter (ca. 1/2) than anthers, these rectangular, upper cells latrorse, lower ones extrorse-latrorse, connectives not extended, flat or emarginate, glands reniform as high as filaments; staminodes of whorl IV not seen; pistillode glabrous, without a stigma or only with a discolored style apex (rarely enlarged), shorter than inner stamens and in a shallow receptacle, which is glabrous or nearly so inside. Pistillate flowers with 9 staminodes, these ca. 0.5 mm long, filaments glabrous, narrower and shorter than anthers, glands of inner three stamens larger than filaments; pistil glabrous, ca. 1.5 mm long, style less than 1/2 the length of ovary, the ovary almost entirely enclosed in the receptacle, which is glabrous inside, stigma large, discoid, at anthesis included in the flower. Fruits ovoid, ca. 10 × 5 mm; the cupule deeply cup-shaped, warty (not lenticellate), with a single margin, ca. 5 mm high × 8 mm wide.

Vernacular. Brazil: "Louro-preto."

Phenology. Flowers: September, October, November, and December. Fruits: April and June.

Habitat. Terra firme forest on clay soil.

Ocotea nigrescens is easy to recognize by its leaves that are blackish when dry (hence the epithet) and have conspicuous whitish reticulation and veins on the upper surface, and by the secondary veins acutely arching, strongly prominent and distinctly loop-connected beneath, with the basal pairs closer together than the rest, and usually with domatia on their axils. *Ocotea bofo* HBK and *Ocotea rubrinervis* Mez, the latter probably a synonym of the former (H. van der Werff, pers. comm.), have very similar leaves, which also present domatia. However, both are shrubs or treelets that have leaves clearly gland-dotted on the upper surface, with short erect hairs on the lower one, and the fruits present a shallow cupule and persistent tepals. While *Ocotea nigrescens* occurs toward the east of Manaus, apparently limited on the west by the Rio Negro and Rio Madeira, *O. bofo* (including *O. rubrinervis*) is known only from the western Amazon (Peru, Colombia, Ecuador), Venezuela (Orinoco basin), and Panama. *Ocotea nigrescens* is known from eastern Pará, Mato Grosso, Rondônia, and Amazonas states in Brazil.

Paratypes. BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W (fl), *Aluísio 237* (INPA), (fl), *Aluísio 240* (INPA, MO), (fl), tree 1731–06, *Assunção et al. 418* (INPA, MO, SP), (fr), tree 1731–06, *Assunção et al. 520* (INPA, MO, SP), (buds), *Prance et al. 2622 (A306)* (INPA), (young fr), *Vicentini et al. 823* (INPA, MO, SP); Distrito Agropecuário, Reserva 1501 (km 41) of the WWF/INPA MCS Project, 02°24′S, 59°43′W (fl), *Boom et al. 8698* (MO, NY), (buds), *Boom et al. 8528* (INPA, MO, NY), (fl), *Mori et al. 20203* (INPA, MO, NY); Distrito Agropecuário, Fazenda Porto Alegre, Reserva 3304 of the WWF/INPA MCS Project, 02°22′S, 59°57′W (young fr), tree 159, *Mars et al. s.n.* (MO, NY), Reserva 1302 of the INPA/WWF MCS Project (buds), tree 2430, *sine coll. s.n., INPA 191109* (INPA); Novo Airão, Área Indígena Waimiri-Atroari, Aldeia Maré, 01°45′S, 61°15′W (young fr), tree 1699, *Miller et al. 666* (INPA, MO); Rio Negro, 120 km above Barcelos (fl), *Madison et al. 6173* (MO). **Mato Grosso:** Rio Juruena (fr), *Rosa & Santos 2195* (MG, MO, NY). **Pará:** Santarém, km 70 da estrada do Palhão, ramal do Caetetu (fl), *Silva & Souza 2546* (MG, MO, NY); km 1131, Cuiabá–Santarém Highway, Igarapé Natal (fl), *Prance et al. P25445* (MG, MO, NY); km 1115, Cuiabá–Santarém Highway, 6°50′S, 55°30′W (fr), *Amaral et al.* 792 (MO). **Rondônia:** Porto Velho, estrada Belmonte (fl), *Mota & Coêlho 92* (INPA); Porto Velho, hwy. BR 364, 20 km ENE of junction with hwy. BR 325, 9°43′S, 65°10′W (st), *Nee 34940* (MO, NY).

Ocotea obliqua Vicentini, sp. nov. TYPE: Brazil. Amazonas: Manaus, Manaus–Itacoatiara road, km 135, 5 Dec. 1966 (fl), *W. Rodrigues & Osmarino 8284* (holotype, INPA; isotypes, MO, NY). Figure 9.

A ceteris speciebus Amazoniae ramulis dense ferrugineo-puberulis, foliis majoribus, subtus secus nerviis dense puberulis et cupula parva disciforme recedit.

Tree to 30 m. Branching presents sylleptic growth, i.e., initial growth without producing leaves, which are evenly distributed on upper half of flushes. Twigs cylindrical and strongly ridged, ca. 3–4 mm diam. 5 cm below terminal bud, the apices and terminal buds completely covered by short crisped ferrugineous hairs, the indument becoming light brown and diminishing with age. Leaves alternate, 9–18 × 4–9 cm, coriaceous, broadly elliptic; the apex acuminate (acumen ca. 1.5 cm long); the base rounded to obtuse; the margins flat; lamina glabrous above, usually drying gray with reddish veins, finely gland-dotted, on the lower surface drying reddish brown, with short erect and crisped hairs, the indument dense but leaving surface visible, decreasing with age, but persisting on the veins (indument very hard to see, even with a microscope); midrib strongly prominent beneath, flat or slightly raised above; secondary veins 7 to 8 pairs, strongly prominent beneath, almost flat above, equally arching, essentially free, but most apical ones loop-connected; tertiary venation distinctly oblique (scalariform), slightly raised on the lower surface; domatia absent; petiole 1.5–2.5 cm long, flat above, with same indument as twigs, glabrescent with age. Inflorescences in the axils of normal leaves, 7–14 cm long, 4 orders of branching; peduncle and lateral

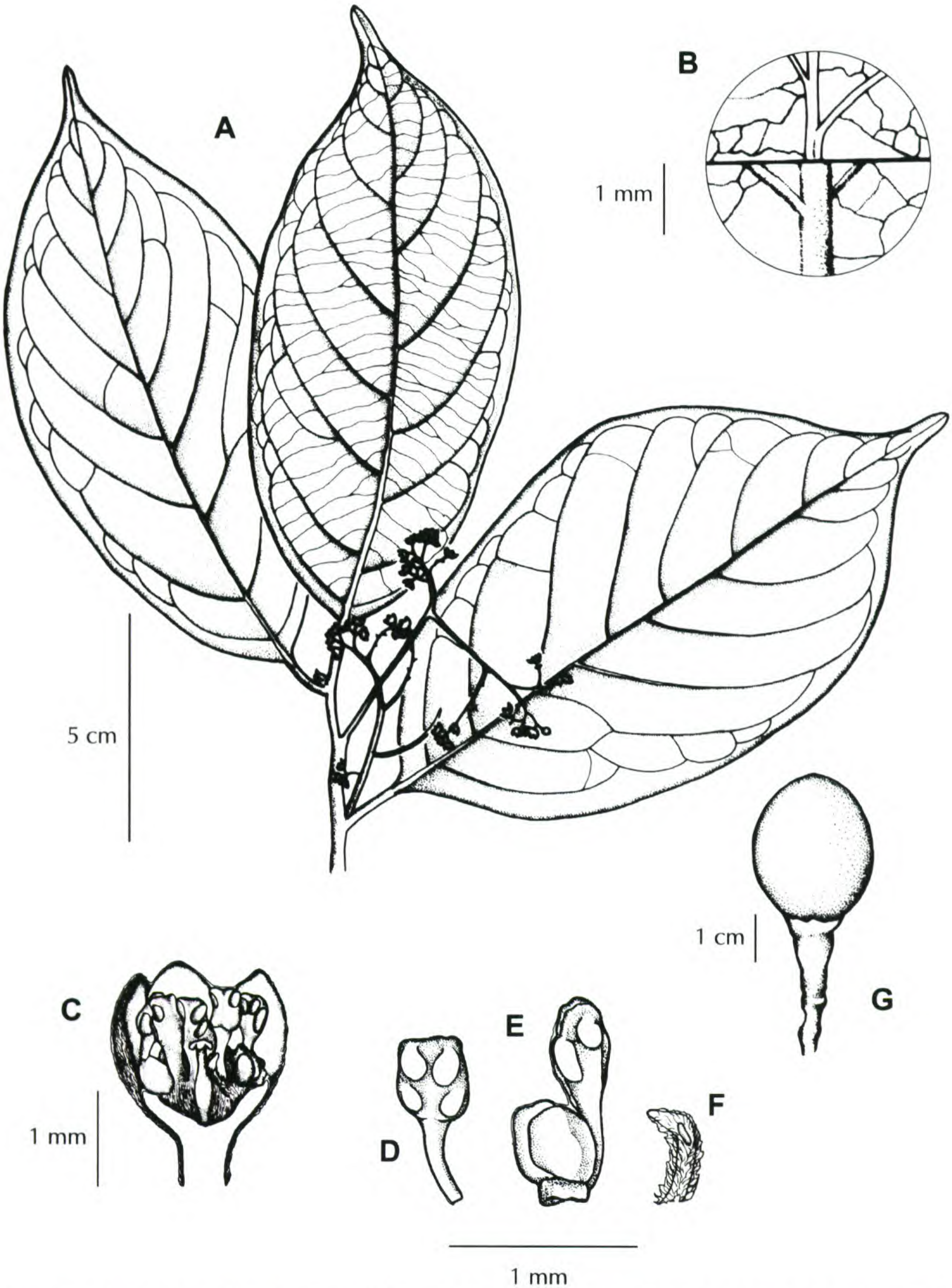


Figure 9. *Ocotea obliqua* Vicentini. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Staminate flower. —D. Stamen of whorl I. —E. Stamen of whorl III, lateral view. —F. Staminode of whorl IV, lateral view. —G. Fruit. (A–F from *Rodrigues 8984*; G from *Rodrigues 7220*.) Drawn by Angelic Katz Nara.

branches covered by a dense indument of short and crisped ferrugineous hairs; bracts and bracteoles caducous at anthesis. Flowers unisexual, 1.5–2 mm diam.; pedicels shorter than flowers, < 1 mm long, pubescent, indument sparser than on inflorescence branches; tepals equal, white, erect at anthesis, ca. 1 mm long, glabrous or nearly so on both surfaces. Staminate flowers with 9, 4-celled stamens; the outer 6 ca. 1.5 mm long, filaments sparsely pubescent, longer and distinctly narrower than anthers, these rectangular, glabrous, upper cells introrse and smaller than the lower ones, which are introrse-latrorse; the inner 3 stamens ca. 1.5 mm long, filaments glabrous or nearly so, longer and distinctly narrower than anthers, lower cells extrorse-latrorse and upper ones introrse-latrorse, glands reniform and shorter than filaments; staminodes of whorl IV, ca. 0.5 mm long, stipitiform and pubescent or absent; pistillode without a stigma, glabrous or nearly so; receptacle shallow and densely pubescent inside. Pistillate flowers unknown. Fruits ellipsoid, ca. 3 × 2 cm; cupule plate-like, ca. 1.3 cm wide × 2 mm high; the pedicels swollen, 2–3 cm long.

Vernacular. "Louro-cedro."

Phenology. Flowers: October and December. Fruits: October and May.

Habitat. Terra firme forest on clay soil.

Ocotea obliqua is easy to recognize vegetatively by its densely puberulous twigs, and the large elliptical leaves with distinct oblique tertiary venation (hence the epithet), that usually dry reddish, with short erect hairs below. The dense, reddish brown indument on the twigs is reminiscent of such species as *O. amazonica* (Meisner) Mez, *O. rhodophylla*, and *O. percurrens*, but these species have smaller leaves and the indument on their twigs is longer. The hairs on the twigs of *O. obliqua* are so short that one can scarcely see their orientation, in contrast to the other species where the hairs are erect. Relationships of *O. obliqua* are not known to me. The small, plate-like cupules are also found in the *O. minarum* group, but species of that group have different flowers and slender, long terminal buds, which are lacking in *O. obliqua*. For the time being the new species has to be considered an isolated species without obvious close relatives. *Ocotea obliqua* is known only from the type locality.

Paratypes. BRAZIL. **Amazonas:** Estrada Manaus–Itacoatiara, km 131 (fl), *Rodrigues 8984* (INPA, MO), (buds), *Rodrigues 9867* (MO), km 135 (fr), *Rodrigues 7220* (INPA), (fr), *Osmarino s.n., INPA 27370* (INPA).

Ocotea percurrens Vicentini, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 2°53′S, 59°58′W, 12 Jan. 1965 (fl), *W. Rodrigues & Osmarino 6835* (holotype, INPA). Figure 10.

Ocoteae amazonicae similis, sed foliis domatiis praeditis, receptaculo florum masculinorum intus pubescente recedit.

Trees to 35 m tall and up to 40 cm DBH. Branching presents sylleptic growth, i.e., branchlets initially grow without producing leaves, which are alternate and evenly distributed on the distal part of flushes. Twigs initially angular soon becoming cylindrical, 2.5–4 mm diam. 5 cm below the terminal bud, covered by a ferrugineous indument of erect and crisped hairs, these becoming grayish with age, and persisting so for at least two flushes; terminal buds covered by the same indument. Leaves 4.8–13.7 × 2.3–5.1 cm, ca. 2–3 times longer than wide, coriaceous, elliptic; the apex acuminate to attenuate (acumen 0.7–2.1 cm long); the base acute to oblique; the margin slightly recurved; lamina upper surface drying grayish, not clearly gland-dotted, with short erect hairs on veins, at least on midrib, lower surface brownish, with short erect or patent hairs, dense but leaving surface visible, indument decreasing with age, and eventually leaving upper surface glabrous, but at least persistent on the veins beneath; midrib raised on both surfaces; secondary veins 4 to 7 pairs, penninerved, evenly arching, the most basal pair longer and more acutely diverging from midrib than most apical, thus loop-connected at the distal part of leaves, slightly raised above, prominent beneath; tertiary venation scalariform, i.e., tertiaries parallel and perpendicular to midrib, flat above, slightly raised beneath; domatia consisting of whitish erect hairs, present in the axils of most secondary veins; petioles 0.5–1.2 cm long, flat above or with lateral ridges, but not canaliculate, with same pubescence as twigs, persisting dense on the petiole of old leaves. Inflorescences 4–7.2 cm long, borne in the axils of normal leaves, 1 to 2 orders of branching; peduncle and lateral branches completely covered by short and ferrugineous erect and crisped hairs, indument becoming shorter and sparser toward the flowers; bracts and bracteoles caducous at anthesis. Flowers unisexual, 2.5–3 mm diam.; pedicels shorter than flowers, ca. 1 mm long, minutely puberulous; tepals equal, cream, spreading at anthesis, ca. 1.5 cm long, outside minutely puberulous, inside glabrous or nearly so. Staminate flowers with 9, 4-celled stamens; outer 6 ca. 0.8 mm long, filaments glabrous, and narrower and shorter than anthers (ca. half their length), anthers ca. 0.5 mm long, cells in two rows, upper pair introrse, lower one latrorse-introrse, connectives not extended beyond them, flat to emarginate; inner 3 stamens ca. 0.5 mm long, filaments glabrous or hairy inside, narrower and shorter than anthers, upper anther cells latrorse-

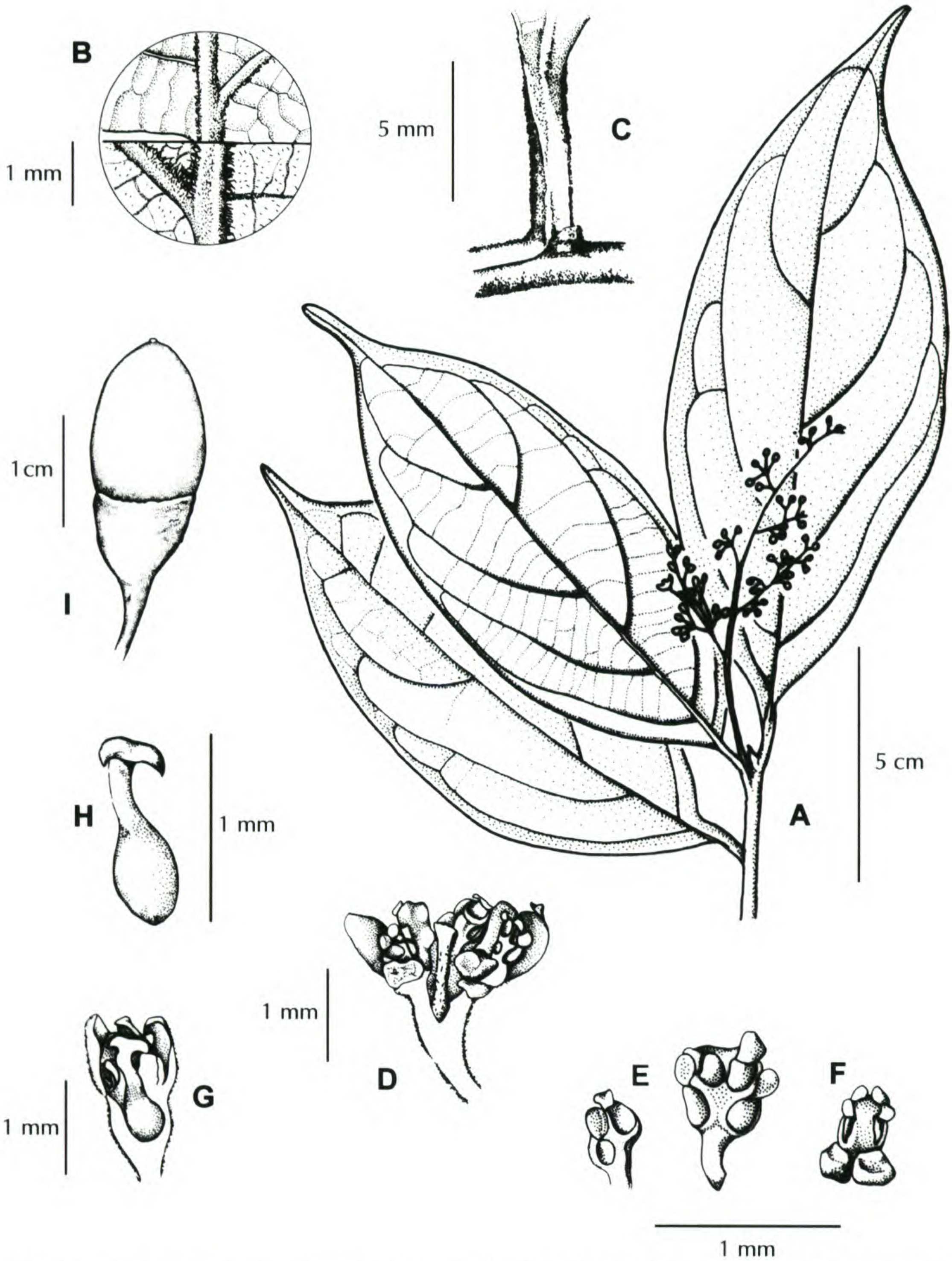


Figure 10. *Ocotea percurrens* Vicentini. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Detail of branch and petiole indument. —D. Staminate flower. —E. Stamens of whorl I (lateral and inner views). —F. Stamen of whorl III. —G. Pistillate flower. —H. Pistil. —I. Fruit. (A–F from *Prance et al. 3846* except lower surface on B, from *Prance et al. 3784*; G, H from *Rodrigues & Rosmarino 6826*; I from *Rodrigues & Loureiro 7091*.) Drawn by Angelic Katz Nara.

apical, lower pair extrorse-latrorse, connectives not extended, usually emarginate, glands reniform and sessile, as long as filaments; staminodes of whorl IV stipitiform, pubescent or glabrous; pistillode with a stigma or sometimes with only a discolored and not enlarged apex, glabrous or nearly so, ovary almost entirely enclosed by the receptacle, which is pubescent inside. Pistillate flowers with 12 (rarely 9) staminodes, the outer 9 ca. 0.3 mm long, glabrous, those of whorl III with globose glands at the base, and those of whorl IV stipitiform and pubescent; pistil glabrous or nearly so, almost entirely enclosed by the receptacle, this glabrous inside, the stigma discoid. Fruit ellipsoid, 0.9–1.5 × 0.5–0.8 cm; cupule cup-shaped, smooth outside, with single margin, ca. 4 mm high × 6 mm wide, pedicel ca. 6 mm long.

Vernacular. Surinam: "witte pisi."

Phenology. Flowers: December and January. Fruits: September, November, and December.

Habitat. Terra firme forest on clay or sandy-clay soils.

Ocotea percurrens is a conspicuous species, easily recognized by its ferrugineous pubescent twigs and petiole, elliptical acuminate leaves with erect hairs beneath and showy tufts of hairs in the axils of most secondary veins (4 to 7 pairs only, acutely arching toward the apex), and the scalariform tertiary venation, perpendicular to the midrib. Three other Amazonian species have similar densely brown or ferrugineous pubescent twigs: *O. amazonica*, *O. matogrossensis* Vattimo, and *O. rhodophylla*. *Ocotea matogrossensis* is the only species in this group with an appressed indument on twigs and leaves; the other species have an erect or crisped indument. *Ocotea percurrens* is the only species in this group with domatia and can thus be readily distinguished from the others. Additional differences between these species are presented in Table 1. Kostermans (1936) used the name *O. petalanthera* (Meisner) Mez for specimens of *O. percurrens* from Surinam. However, the type of *O. petalanthera* has sparsely to moderately pubescent twigs, with the surface largely or partially visible. The hairs are appressed and rather pale, and these pubescence characters clearly separate *O. petalanthera* from the group of *O. amazonica*, *O. percurrens*, and *O. rhodophylla*. *Ocotea percurrens* is distributed in the northeastern part of the Amazon Basin, not known to the west of Manaus and to the south of the Amazon River, occurring in Surinam and presenting a disjunct distribution in the Atlantic Forest in Bahia. The only known collection from this area, *Folli 882*, presents smaller leaves, which are waxy below and with patent hairs, but I did not find any other differences that would lead me to treat it as a different species.

Paratypes. BRAZIL. **Amapá:** BR 156, 53 km WNW of Calçoene, 2°33′N, 51°16′W (fl), *Mori et al. 17328* (MG, MO, NY); BR 156, km 109 SSE of Oiapoque, 3°0′N, 51°30′W (fr), (MG, MO, NY); BR 156, 50 km SSE of Oiapoque, 3°21′N, 51°41′W (fl), *Rabelo et al. 2852* (MG, MO, NY). **Amazonas:** Distrito Agropecuário da Suframa, Reserva 1501 ("km 41") of the PDBFF project, 2°24′N, 59°43′W (fr), *Kukle 21* (MO, NY), (young fr), *Lepsch da Cunha et al. 237* (MO, NY), (buds), *Pacheco et al. 98* (INPA, MO, NY), (fl), *Pacheco et al. 115* (MO, NY); Fazenda Porto Alegre, Reserva 3304 of the PDBFF project, 2°22′N, 59°57′W (young fr), tree 1334, *Mars et al. s.n.* (MO, NY), (fr), tree 4652, *Pereira et al. s.n.* (INPA, MO), Reserva 3402 of the PDBFF project (fr), tree 677.2, *Sothers et al. s.n.* (INPA, MO); hwy. Manaus–Itacoatiara, km 204 (buds), *Prance et al. 3784* (MO, NY); Manaus, Reserva Florestal Ducke, 02°53′S, 59°58′W (st), *Gentry & Nelson 69204* (INPA, MO), (fl), *Prance et al. 3846* (INPA, MO, NY), (buds), *Rodrigues & Osmarino 6815* (INPA, NY), (buds), *Rodrigues & Osmarino 6820* (NY), (fl), *Rodrigues & Osmarino 6826* (NY), (buds), tree 862–06, *Vicentini et al. 768* (INPA, MO, SP); Mun. de Novo Airão, Área Indígena Waimiri-Atroari, Aldeia Maré, 1°45′S, 61°15′W (fr), *Miller et al. 742* (INPA, MO). **Bahia:** Reserva Florestal de Porto Seguro da CVRD/BA (fl), *Folli 882* (MO). **Pará:** Itaituba, Jacareacanga, Parque Nacional do Tapajós (buds), *Silva & Rosário 3727* (MG, MO). FRENCH GUIANA. Dorlin, 3°45′N, 53°33′W (young fr), *Sabatier & Birnbaum 4450* (CAY, MO); Fleuve Approuague, Riv. Arataye, Sauts Parare (st), *Barrier 5079* (MO), (st), *Barrier 5072* (MO), (st), *Barrier 5156* (MO), 70 km SW Regina (st), *Villiers & Feuillet 2057* (MO). SURINAM. Jodensavanne-Mapane kreek area, (fl), *Schulz–LBB 8392* (MO, NY), (fl), *Lindeman 1961* (MO); Brownsberg (st), *Kanhai–LBB 13252* (MO, U), (fl), *Vreden–LBB 13707* (MO, U), (fl), tree 1284, *Boschwezen (BW) 6766* (MO); Brokopondo Lake, 20 km from Brownsweg (st), *van Donselaar 1880* (MO); Coesewijne (st), *Pinas–LBB 9529* (MO); Fallawatra (fr), *Jimenez-Saa 1617* (MO, U), (diseased fruit), *Jimenez-Saa 1695* (MO); Mapane Cr. Area (st), *Schulz–LBB 9332* (MO); Sectie O (st), *Stahel 67* (MO, U), (young fr), tree 574, U herb no. 2905 (MO, U), (fl), tree 574, U herb. no. 2509 (MO, U).

Ocotea rhodophylla Vicentini, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 2°53′S, 59°58′W, 23 Jan. 1995 (fl), *A. Vicentini et al. 888* (holotype, INPA; isotypes, MO, SP). Figure 11.

Ocoteae amazonicae similis, sed receptaculo intus pubescente, foliis ellipticis subtus ceraceis, pistillodio stipitiforme sine stigmate differt.

Trees to 20 m. Branching presents continuous growth, the leaves alternate and evenly distributed along twigs. Twigs initially angular soon becoming cylindrical, 3–4 mm diam. 5 cm below terminal bud, covered by ferrugineous indument of erect and crisped hairs, these becoming grayish with age, and

Table 1. List of diagnostic character states of selected *Ocotea* species from the Manaus area and of *Ocotea* species with which they have been confused. (+) = present, (O) = absent, (-) = unknown; under receptacle indument (s) = staminate flower, (p) = pistillate flower.

	Twig indument			Leaf indument abaxially				Tepals		Pistillode		Cupule	
				Hairs									
Species	Density	Type	Domatia	Density	Type	Waxy below	Receptacle indument	Hairs outside	At anthesis	Hairs	Stigma	Tepals on	Form
O. amazonica	Dense	Erect	O	Sparse	Erect	O	O	Sparse	Reflexed	O	+/O	O	Shallow
O. bofo	Sparse	Erect or ascending	+	Sparse	Erect and minute			Sparse				+	Shallow
O. cinerea	Moderate to Sparse	Appressed	+/O	O		O	+(s) O(p)	O or Sparse	Spreading	O	O	O	Shallow, bowl-shaped
O. delicata	Dense	Erect	O	Sparse	Erect	O	+	Sparse	Erect	O	+	+	Shallow
O. minor	Moderate	Appressed	+	O		O	+	O	Erect	+	+/O	O	Shallow, cup-shaped
O. nigrescens	Moderate to sparse and glabrescent	Erect and minute	+/O	O	Erect Erect	O	O	O	Erect	O	O	O	Deeply cup-shaped
O. obliqua	Dense	Erect or crisped	O	Dense	Erect	O	+	O	Erect	O	O	O	Plate-like
O. percurrens	Dense	Erect or crisped	+	Sparse	Erect	O	+ (s) O (p)	Moderately dense, minute	Spreading	O	+/O	O	Cup-shaped
O. petalanthera	+	Appressed	+	+	Appressed	O	—	—	—	—	—	—	—
O. rhodophylla	Dense	Erect and Crisped	O	Moderate	Erect	+	+	O	Spreading	+	O	O	Plate-like

Table 1. Continued

Species	Twig indument		Domatia	Leaf indument abaxially			Receptacle indument	Tepals		Pistillode		Cupule	
				Hairs		Waxy below		Hairs outside	At anthesis	Hairs	Stigma	Tepals on	Form
	Density	Type		Density	Type								
O. scabrella	Dense	Erect	0	Moderate to sparse	Erect	0	+(s) 0(p)	Sparse	Spreading	0	+/0	+	Shallow
O. schomburgkiana	0		+	0		0	+	0 or Sparse	Spreading	0	+	0	Deeply cup-shaped
O. subterminalis	Moderate to sparse	Erect and minute	+/0	0		0	Sparse (s) 0 (p)	Moderately dense, minute	Spreading	0	+	0	Deeply cup-shaped

persisting so for at least two flushes; terminal buds densely erect pubescent. Leaves 5.8–16 × 2.8–7.4 cm, ca. 1.7–3 times longer than wide, coriaceous, elliptic to ovate; the apex acuminate; the base obtuse or oblique; the margins flat or at the base recurved; lamina upper surface not gland-dotted, glabrous, midrib sometimes pubescent at the base, lower surface reddish, waxy, with erect and crisped hairs, the indument dense, but leaving surface visible and decreasing with age; midrib above prominent in an impression below the leaf surface, strongly prominent beneath; secondary veins 5 to 7 pairs, penninerved, veins essentially free, but most apical loop-connected, evenly arching, above flat, below prominent; tertiary venation reticulate, but with some well developed oblique tertiary veins, these not forming a uniform pattern, flat above, slightly prominent beneath; reticulation fine and usually more conspicuous on the upper surface; venation frequently with dark dots (resinous) on the lower surface; domatia absent; petioles 0.8–1.5 cm long, flat above, pubescent as twigs, indument decreasing with age, but rarely surfaces becoming completely glabrous. Inflorescences 1.5–5.8 cm long, borne in the axils of normal leaves, 1 to 2 orders of branching; peduncle and lateral branches covered by erect and crisped hairs, indument becoming sparser toward the flowers. Flowers unisexual, ca. 3 mm diam., pedicels shorter than flowers, 0.6–1.2 mm long, with short ascending hairs; tepals equal, white, spreading at anthesis, ca. 1.5 mm long, outside glabrous or nearly so. Staminate flowers with 9, 4-celled stamens; the outer 6 ca. 0.7 mm long, filament ca. 0.3 mm long, narrower than and as long as anthers, these with introrse cells in two rows, connective flat, not extended beyond cells; inner 3 stamens ca. 0.7 mm long, filaments narrower than and as long as anthers, introrsely pubescent, upper cells introrse-latrorse, lower ones latrorse to extrorse-latrorse, glands reniform and as high as filaments; staminodes of whorl IV stipitiform and pubescent; pistillode absent or reduced without stigma and pubescent; receptacle pubescent inside. Pistillate flowers with 12 staminodes, outer 9 ca. 0.5 mm long, glabrous, those of whorl III with small reniform glands at the base; staminodes of whorl IV stipitiform and pubescent; pistil glabrous, ovary positioned almost half inside the receptacle, which is pubescent inside, stigma discoid. Fruit globose, ca. 1 cm diam., cupule plate-like, with single margin, ca. 1–2 mm high × 4–5 mm wide.

Vernacular. Venezuela: "laurel blanco," "atudacani."

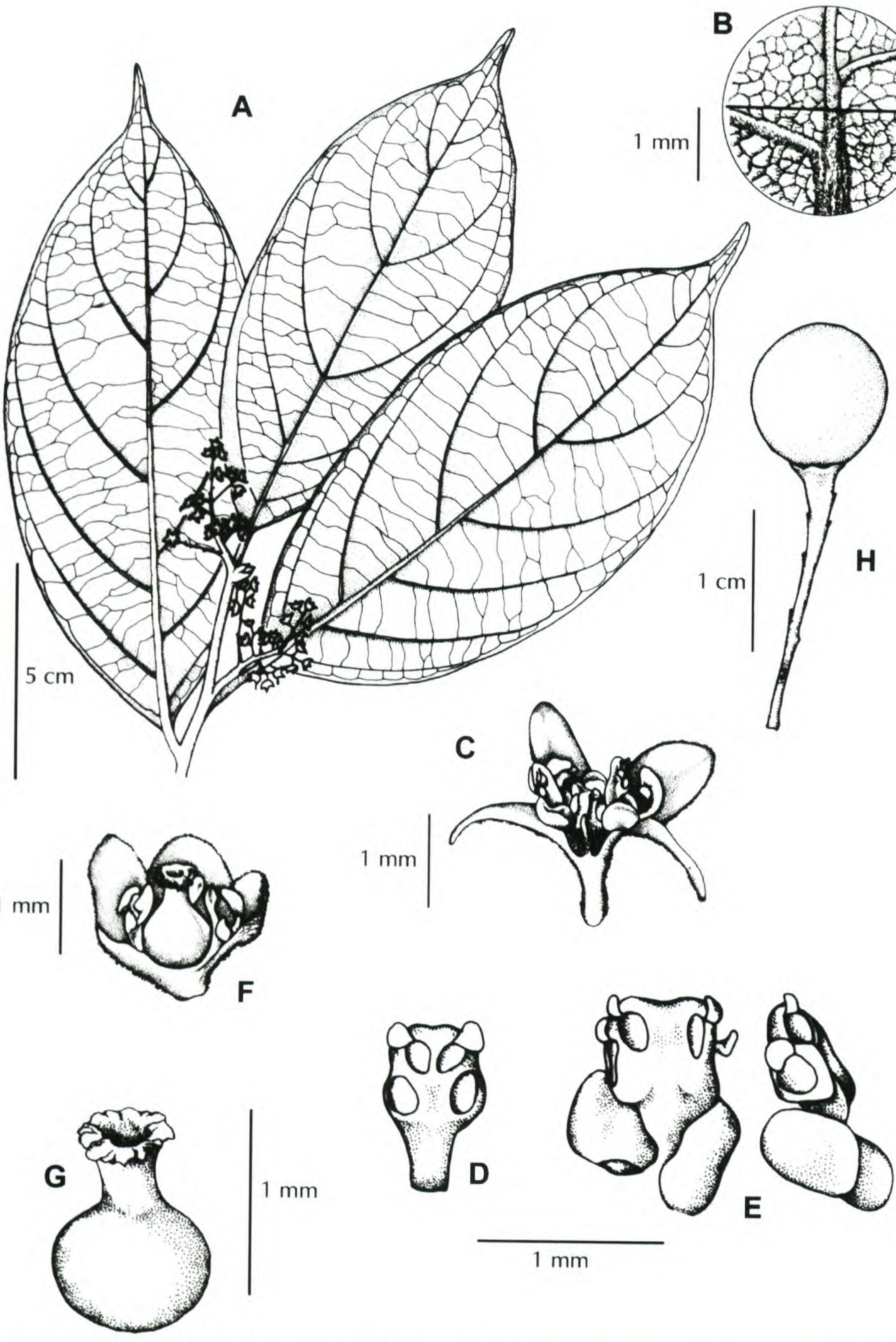


Figure 11. *Ocotea rhodophylla* Vicentini. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Staminate flower. —D. Stamen of whorl I. —E. Stamen of whorl III (outer and lateral views). —F. Pistillate flower. —G. Pistil. —H. Fruit. (A, B from *Vicentini et al. 889*; C–E from holotype, *Vicentini et al. 888*; F, G from *Vicentini et al. 891*; H from *Rodrigues & Loureiro 5756*.) Drawn by Angelic Katz Nara.

Phenology. Flowers: January, February, May, July, and September. Fruits: February, April, and May.

Habitat. Campinarana forest on white-sand soil.

Collections of *Ocotea rhodophylla* have been identified as *O. amazonica* or *O. rubrinervis* Mez, mainly because these three, possibly closely related species, present erect or crisped hairs on the lower leaf surface. However, it clearly differs from the types of both species: *Ocotea amazonica* is a small tree with usually obovate leaves, flowers with reflexed tepals at anthesis, the pistillode glabrous and usually with a well-developed stigma, the receptacle glabrous in both sexes, lacking staminodes of whorl IV, while *O. rhodophylla* is a canopy tree, with elliptical leaves, these waxy below, flowers with spreading tepals at anthesis, the pistillode is absent or reduced without a stigma and pubescent, the receptacle pubescent in both pistillate and staminate flowers, these bearing staminodes of whorl IV. The fruits of these two species are very similar (globose, ca. 1 cm diam. on a shallow cupule), suggesting that these are closely related taxa. *Ocotea rhodophylla* also resembles *O. rubrinervis*; the latter species has a sparse, erect indument on the lower leaf surface, domatia in the form of axillary tufts of hairs, a clearly gland-dotted upper leaf surface, persistent tepals on the cupule, and a sparser indument consisting of ascending, pale hairs on the twigs with the surface always partially visible. *Ocotea rubrinervis* does not have a waxy lower leaf surface. *Ocotea rhodophylla* is also similar to *O. matogrossensis*, both presenting a waxy lower leaf surface, but the indument on the latter is distinctly appressed and the leaves are obovate with an attenuate and decurrent base. *Ocotea rhodophylla* is distributed in the western portion of the Amazon Basin in Venezuela, Colombia, Peru, and Brazil; it is not found east of the Manaus area.

Paratypes. BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke, 2°53′S, 59°58′W (fr), *Rodrigues & Loureiro 5756* (NY), (fl), *Vicentini et al. 889* (INPA, MO, SP), (fl), *Vicentini et al. 891* (INPA, MO, SP), (fl), *Vicentini et al. 892* (INPA, MO, SP); Mun. de Maués, basin of Rio Maués, Rio Urupadi, 3°43′S, 57°16′W (fl), *Zarucchi et al. 3078* (INPA, MO, NY). **Roraima:** Estação Ecológica Ilha de Maracá, 3°19′N, 61°55′W (fl), *Milliken et al. 624* (MO). COLOMBIA. **Amazonas:** Rio Caqueta, Araracuara (fl), *Vester 261* (MO). PERU. **Madre de Dios:** Rio D'Orbigny near junction with Rio La Torre, 12°55′S, 69°20′W (buds), *Gentry & Jaramillo 57801* (MO); Tambopata, 12°49′S, 69°18′W (fr), tree 3002, *Gentry et al. 45914* (MO), (fr), tree 3093, *Gentry et al. 46011* (MO). **Loreto:** Maynas, Distrito Fernando Lores, Caserio Serafin, 4°08′S, 72°55′W (fr), *Grández et al. 2543* (MO), Iquitos, Rio Nanay, Puerto Almendras, 3°48′S, 73°25′W (fl), *Vásquez & Jaramillo 10781* (MO), Rio Nanay halfway between Iquitos and Santa Maria de Nanay, 3°52′S, 73°30′W (fl), *Gentry et al. 39458* (MO), along Rio Nanay, (fl), *van der Werff et al. 10189* (MO); Requena, Sapuena, J. Herrera, 4°50′S, 73°45′W (fl), *Vásquez 10439* (MO), Rio Ucayali, arboretum (fr), *Gentry et al. 21168* (MO). VENEZUELA. **Amazonas:** San Carlos de Rio Negro, 3°56′N, 67°03′W (fl, young fr), *Clark & Maquirino 7360* (MO), (fl), *Clark 7282* (MO); Casiquiare, 12 km SE of San Fernando de Atabapo, 3°50′S, 67°47′W (fl), *Aymard et al. 6420* (MO, PORT). **Bolívar:** basin of rio Caura, caño Maskani (fr), *Stergios & Delgado 12814* (MO, PORT); Serranía de Maigualida, 6°9′S, 65°54′W (fr), *Stergios & Delgado 13805* (MO, PORT).

Ocotea scabrella van der Werff, sp. nov. TYPE: Brazil. Pará: Município de Almerim, Rio Jari, reserva florestal da SEMA, 12 Oct. 1987 (fl), *A. S. Tavares 194* (holotype, MO). Figure 12.

Ocoteae bofo affinis, sed indumento brevissimo ramulorum, tepalis per anthesin patentibus et domatiis absentibus differt.

Small tree or shrub, to 10 m. Twigs terete, solid, with a (rather) dense indument of short (up to 0.1 mm long), erect, brown or whitish hairs; terminal buds densely and minutely whitish pubescent. Leaves 11–24 × 4.5–11 cm, chartaceous, narrowly to broadly elliptic, alternate; the base acute to rarely obtuse; the apex acute or acuminate, the acumen to 2 cm long; the upper surface glabrous or with some minute, erect hairs along the midvein and lateral veins; the lower surface sparsely to moderately puberulous with minute, erect, whitish hairs, these denser along the major veins; the upper surface with the midrib and lateral veins slightly impressed or immersed, and the tertiary venation somewhat raised; the lower surface with midrib and lateral veins (prominently) raised and the tertiary venation (weakly) raised; domatia lacking; petioles 0.7–1.3 cm long, with the same indument as the twigs, flat on the upper side. Inflorescences in the axils of leaves, 5–12 cm long, paniculate-cymose, moderately puberulous with minute, erect, whitish hairs; the flowers almost sessile and arranged in dense glomerules. Flowers white, unisexual, 3–4 mm diam.; the tepals at anthesis spreading (pistillate flowers) to reflexed (staminate flowers). Staminate flowers with tepals ca. 2 mm long, sparsely pubescent on both surfaces; fertile stamens 9, all 4-celled; the outer 6 with the cells introrse, or the lower pair lateral, glabrous, the filaments slender, ca. 1 mm long, the anthers ca. 0.6 mm long; the inner 3 the same size, but with 2 large glands at the base of the filaments; staminodes not seen; pistillode glabrous, stipitiform, not surpassing and largely hidden by the glands, without a stigma or pistillode about twice as long as the glands and with a small stigma; receptacle shallow, pubescent

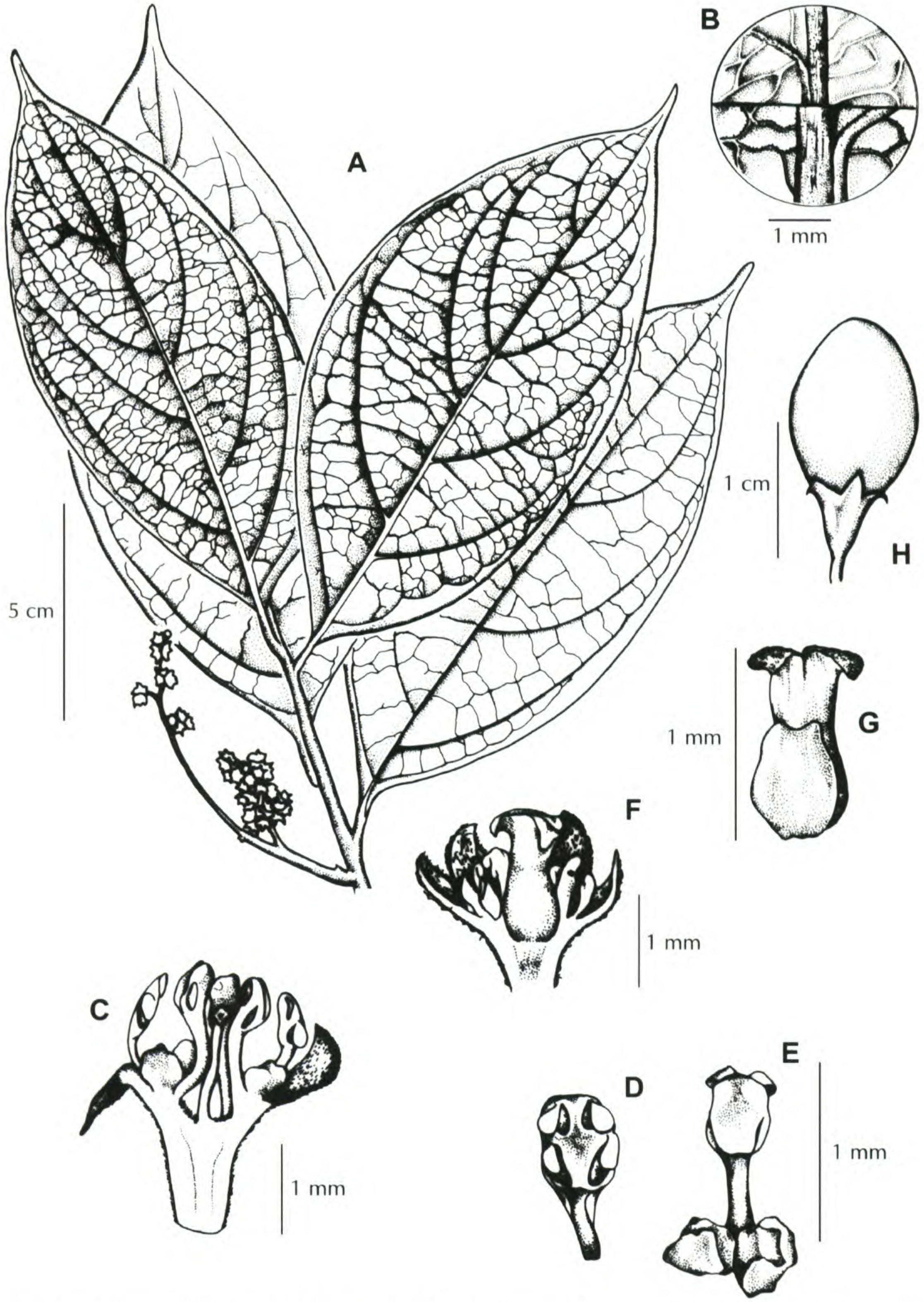


Figure 12. *Ocotea scabrella* van der Werff. —A. Habit. —B. Details of the upper (at top) and lower surfaces. —C. Staminate flower. —D. Stamen of whorl I and II. —E. Stamen of whorl III. —F. Pistillate flower. —G. Pistil. —H. Fruit. (A, B from *Rodrigues 559*; C–E from *Assunção 574*; F, G from *Vicentini 606*; H from *Sothers 675*.) Drawn by Angelic Katz Nara.

inside. Pistillate flowers with tepals as in staminate flowers; staminodia 9, glabrous, ca. 0.6 mm, the inner 3 with 2 glands at the base; staminodia of whorl IV threadlike, pubescent, 0.4 mm long; pistil 1.5–1.8 mm long, glabrous, stigma swollen; receptacle shallow, glabrous inside. Fruits ellipsoid, ca. 13 × 8 mm; cupule shallowly cup-shaped to almost plate-like, with persistent tepals on the margin; the pedicel thickened.

Phenology. Flowers: January, June, July, August, September, and October. Fruits: September, November, and January.

Habitat. Terra firme forest on clay soil.

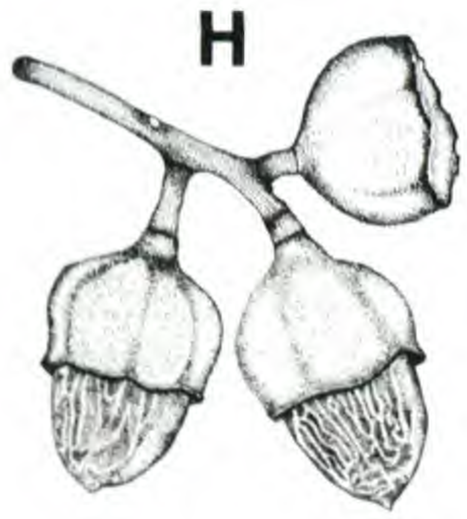
Ocotea scabrella resembles *O. bofo* and *O. rubrinervis* in having cupules with persistent tepals, but differs in the absence of domatia, in the very short, erect indument of the twigs, in the spreading tepals at anthesis, in the clustered flowers, and in the very small pistillode without a stigma in the staminate flowers. The pubescent receptacle of the staminate flowers is also a useful character. *Ocotea amazonica* differs from *O. scabrella* in the longer, reddish hairs on the twigs, in the cupule without persistent tepals, and in the less branched inflorescence. Although gland dots are visible on the upper leaf surface of *O. scabrella,* they are not as conspicuous and black as in *O. bofo* and *O. rubrinervis.* My concept of *O. rubrinervis* is based on the syntype (*Poeppig 4580,* B), that of *O. bofo* on a type photo, and of *O. amazonica* on a type (*Poeppig 3037B,* B). One of the characters used by Mez (1889) in the delimitation of these species is the relative length of the filaments of the stamens. I found that in young flowers the filaments can be shorter than the anthers, while in older flowers they are clearly longer than the anthers, and this character should therefore be used with care. *Ocotea commutata* (Nees) Mez, another shrubby species with persistent tepals on the shallow, almost plate-like cupules and known only from French Guiana, differs in its abruptly rounded leaf bases and in the absence of the very short, erect hairs on the twigs; no flowers of this species are known to me.

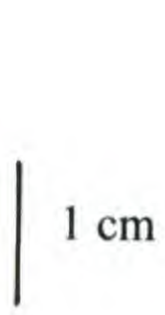
Paratypes. BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke, 2°53′S, 59°58′W (fl), *Assunção & Silva 574* (INPA, MO, SP), (fr), *Assunção et al. 609A* (INPA, MO, SP), (st), *Gentry & Nelson 69037* (INPA, MO), (st), *Gentry & Nelson 69053* (INPA, MO), (fl), *Ribeiro et al. 962* (INPA, MO, SP), (fr), *Ribeiro et al. 1719* (INPA, MO, SP), (fl), *Rodrigues & Osmarino 7030* (INPA, NY), (fr), *Rodrigues & Emygdio 8950* (INPA, MO), (fr), *Sothers & Silva 675* (INPA, MO, SP), (fl), tree 1281-06, *Vicentini & Assunção 606* (INPA, MO, SP), (buds), *Vicentini et al. 1222* (INPA, MO, SP); Mun. de Novo Airão, Area Indígena Waimiri-Atroari, Rio Camanau, 1°45′S, 61°15′W (fl), *Miller 685* (MO). **Rondônia:** Porto Velho, Represa Samuel, Rio Jamari, 8°47′S, 63°25′W (fl), *Thomas et al. 5185* (MO, NY). FRENCH GUIANA. **Gobaya Soula:** Bassin du Maroni, 3°37′N, 53°58′W (fr), *de Granville et al. 10388* (B, CAY, MO, P, US). **Saül:** vicinity of Eaux Claires, Sentier Botanique, 3°37′S, 53°12′W (fr), *Mori et al. 22821* (MO, NY), (young fr), *Mori et al. 22822* (MO, NY), (st), *Mori et al. 20985* (MO, NY).

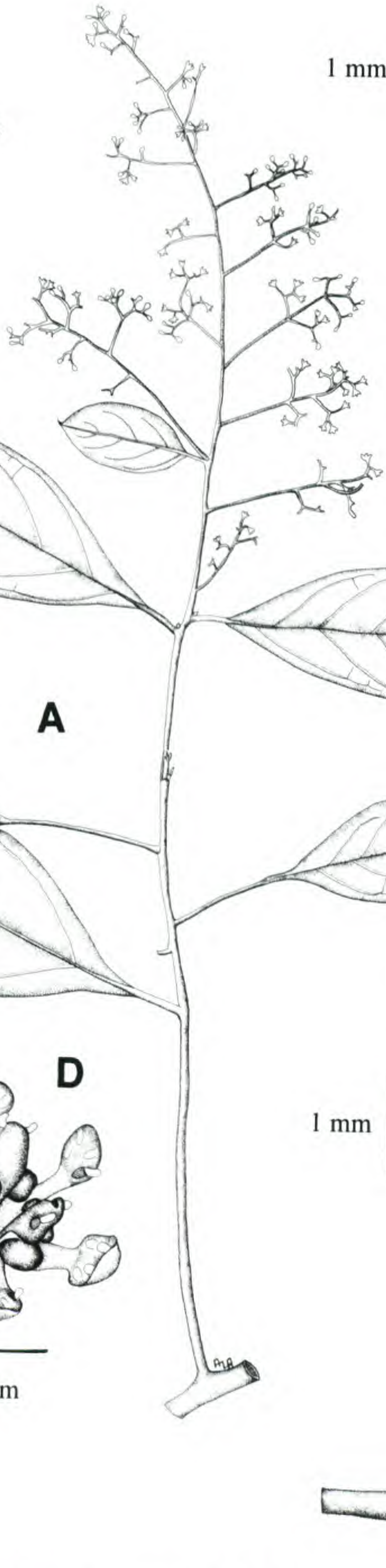
Ocotea subterminalis van der Werff, sp. nov. TYPE: Brazil. Amapá: Mun. de Mazagão, 0°08′S, 51°48′W, 19 Dec. 1984 (fl), *S. Mori & Cardoso 17453* (holotype, MO). Figure 13.

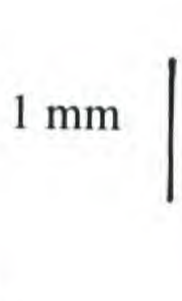
Ocoteae schomburgkianae affinis sed ramulis minute puberulis, cupulis foliisque majoribus recedit.

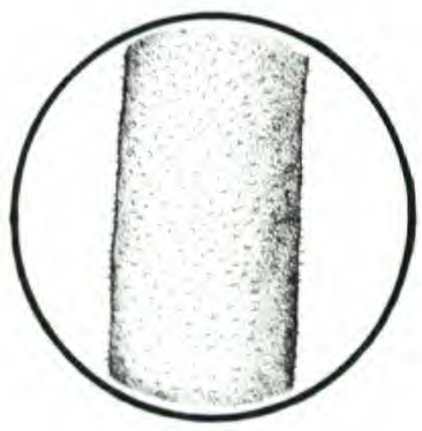
Trees, to 20 m. Twigs roundish, moderately or sparsely minutely puberulous, the hairs straight and erect, glabrescent with age, solid; terminal buds densely white puberulous. Leaves 11–20 × 4.5–7 cm, alternate, firmly chartaceous, elliptic to ovate-elliptic; base acute; apex acuminate with the acumen to 2 cm long or acute; upper surface glabrous; lower surface glabrous or with some minute whitish hairs; margin frequently thickened, flat; midrib, lateral veins, and tertiary venation immersed on the upper surface, the midrib and lateral veins lighter in color than the leaf tissue; midrib and lateral veins raised, tertiary venation weakly raised or immersed on the lower surface; lateral veins 4 to 6 on each side; domatia consisting of axillary tufts of hairs present, small, or lacking; petioles 0.8–1.6 cm, flat to weakly canaliculate on the upper side, with the same indument as the twigs. Inflorescences 5–12 cm, paniculate-cymose, sparsely to moderately and minutely puberulous, in the axils of bracts near the tips of the branches and appearing terminal or, less frequently, in the axils of normal leaves. Flowers unisexual, 3–4 mm diam., the tepals somewhat spreading at anthesis. Staminate flowers with tepals broadly ovate, 1.5 mm long, sparsely puberulous outside, glabrous inside; outer 6 stamens ca. 1 mm long, glabrous, the cells arranged in 2 pairs, introrse, the filament half as long as the anther; the inner three stamens as long as the outer 6, the cells extrorse-lateral, the filaments with 2 globose glands at the base; staminodia not seen; pistillode ca. 2 mm long, stipitiform, glabrous, stigma small but present; receptacle deep, sparsely pubescent inside. Pistillate flowers with tepals as in staminate flowers; outer 6 staminodia 0.6 mm long, glabrous; inner 3 staminodes as long as outer 6, with 2 glands at the base; pistil ca. 2 mm long, glabrous, the stigma peltate; receptacle deeply cup-shaped, glabrous inside. Fruits 1.6 × 1.1 cm, ovoid, largely enclosed in the deeply cup-shaped cupule, this usually lenticellate, with a sin-

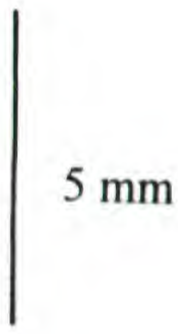


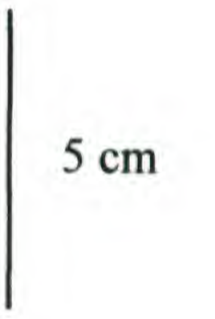


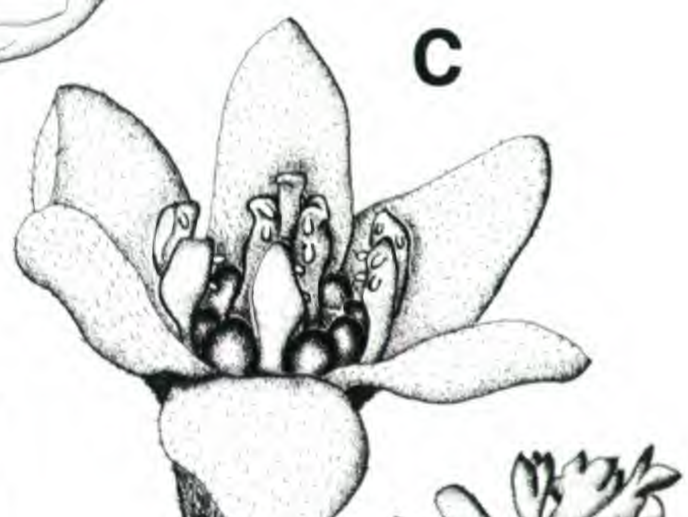


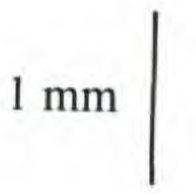


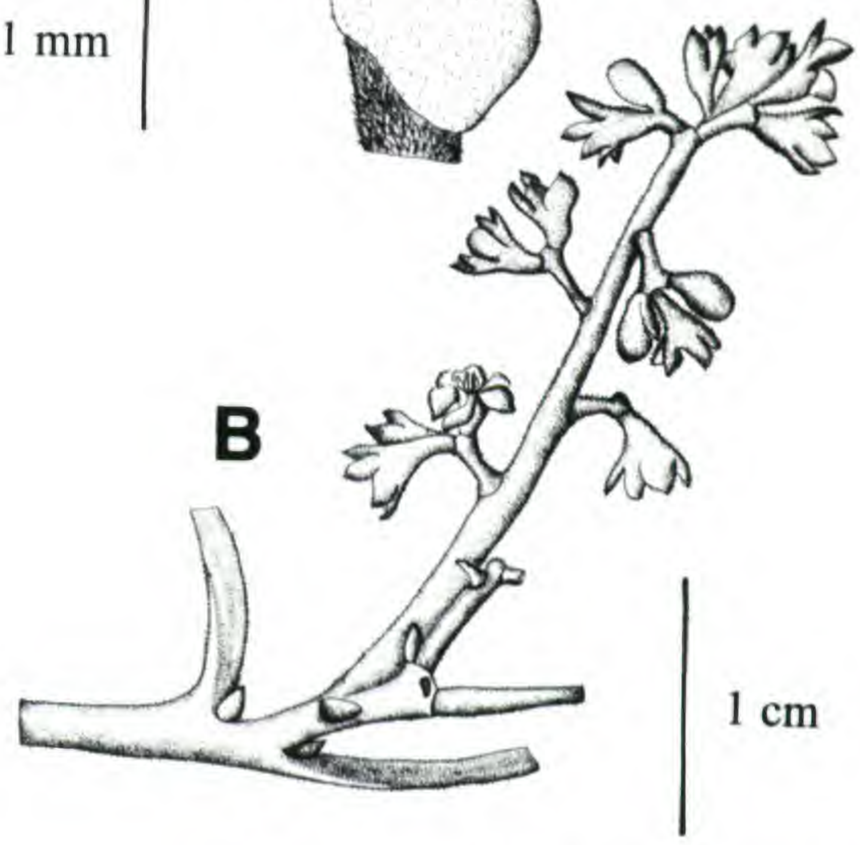


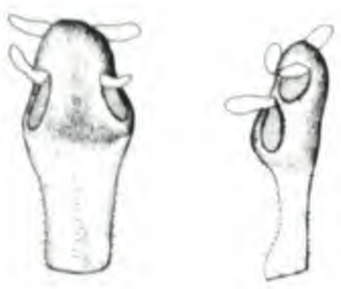












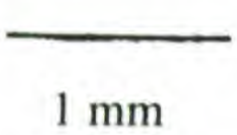


Figure 13. *Ocotea subterminalis* van der Werff. —A. Habit. —B. Inflorescence. —C. Flower. —D. Flower with tepals removed. —E. Stamens of whorl I and II (below) and whorl III (above). —F. Indument on twig. —G. Domatium in axil of lateral vein on lower leaf surface. —H. Cupule and fruits. (A–G from *Rabelo et al. 3041*; H from *Lepsch da Cunha & Assunção 215a.*) Drawn by Alba L. Arbelaez.

gle margin, 1.6 × 1.2 cm, the pedicel not or scarcely thickened.

Phenology. Flowers: September, November, December, and January. Fruits: June, August, September, and November.

Habitat. Terra firme forest on clay or sandy-clay soils.

The relatively large cupules, the ovoid fruits, the frequently terminal-appearing inflorescences, and the small domatia, which sometimes may be lacking, suggest a relationship of *O. subterminalis* with *O. schomburgkiana.* The latter species differs in having smaller cupules and fruits, smaller leaves and inflorescences, and in the lack of the very short, erect indument on the twigs. Various labels mention that the slash is orange and the wood fragrant.

Paratypes. BRAZIL. **Amapá:** Macapá, hwy. Cupixirio Vila Nova, 0°32′S, 51°52′W (fl), *Mori & Cardoso 17703* (MO); Mazagão, hwy. BR156 (fl), *Rabelo et al. 3041* (MO). **Amazonas:** Distr. Agropecuário da Suframa, Reserva 1501 ("km 41") of the PDBFF project, 2°24′S, 59°43′W (fr), *Lepsch da Cunha & Assunção 215a* (MO), (fl), *Boom et al. 8651* (MO), (fl), *Oliveira et al. 277* (MO), (st), *Nee 42630* (MO, NY), (fr), *Pessoal do PDBFF s.n. (= INPA 191123)* (INPA); Manaus, Reserva Florestal Ducke, 2°53′S, 59°58′W (fr), *Martins & Pereira 10* (INPA, MO, SP), (fr), *Loureiro s.n. (= INPA 16565)* (INPA, NY), (fl), *Rodrigues & Osmarino 8287* (INPA), (fl), tree 1353–06, *Sothers & Silva 182* (INPA, MO, SP). **Maranhão:** Monção, basin of rio Turiaçu, Ka'apor Indian Reserve (fr), *Balée 331* (MO, NY). **Pará:** Oriximiná, Rio Trombetas, estrada da Mineração do Norte, km 60 (fr), *Cid et al. 1968* (INPA, MO); Rio Trombetas, vicinity of Cachoeira Porteira (fr), *Prance et al. 22229* (MO, NY). FRENCH GUIANA. **Sinnamary River:** above Petit Saut, between Cr. Plomb and Cr. Tigre, 5°00′N, 53°01′W (buds), *Mori et al. 23562* (MO, NY), (buds), *Mori et al. 23394* (MO, NY), (st), *Mori et al. 23512* (MO, NY), (st), *Mori et al. 23667* (MO, NY), (st), *Mori et al. 23650* (MO, NY). **Saül:** 3°37′N, 53°12′W, vicinity of Eaux Claires, Sentier Botanique (fr), *Mori et al. 22777* (MO, NY), (fl), *Mori et al. 23312* (MO, NY). **Station des Nouragues:** basin de l'Arataye, 4°3′N, 52°42′W (fr), *Sabatier & Prevost 2980* (CAY, MO). Placed in *O. subterminalis* with some hesitation are the following three collections: FRENCH GUIANA. **Saül:** (fr), *Mori & Ishikawa 20838* (MO, NY), (fr), *Mori & Gracie 23932* (MO, NY), *Prance et al. 30652* (MO, NY). These specimens differ in having slightly recurved leaf bases and a dense indument on the young twigs.

Rhodostemonodaphne recurva van der Werff, sp. nov. TYPE: Brazil. Amazonas: Manaus, Reserva Florestal Ducke, 2°53′S, 59°58′W, 5 Aug. 1994 (fl), *A. Vicentini et al. 653* (holotype, INPA; isotypes, MO, SP). Figure 14.

Rhodostemonodaphne peneiae similis, sed 6 staminibus exterioribus 2-locellatis ramulisque indumento obtectis recedit.

Dioecious trees, to 20 m. Twigs ridged, the surface completely covered by gray ascending to appressed hairs, these hairs turning darker with age; terminal buds densely pubescent. Leaves 5–10 × 2–4 cm, alternate, firmly chartaceous, obovate-elliptic to elliptic; the apex obtuse or bluntly acute; the base angustate, gradually narrowed into the petiole; the margin recurved over most of its length, but more strongly so toward the base; the upper surface appressed pubescent when young, becoming quickly glabrous with age; the lower surface moderately densely appressed pubescent, glaucous; midrib, lateral veins, and tertiary venation immersed on the upper surface; midrib raised, lateral veins and tertiary venation weakly raised on the lower surface; lateral veins 3–4; domatia lacking; petioles 1.7–2.5 cm, with the same indument as the twigs. Inflorescences axillary, 3–8 cm long (pistillate inflorescences shorter than staminate), densely pubescent, the hairs appressed or ascending, paniculate-cymose. Flowers unisexual, densely pubescent outside, 4–5 mm diam.; tepals spreading, greenish; stamens red. Staminate flowers with tepals pubescent on the inner surface, ca. 2 mm long, broadly ovate; stamens 9; the outer 6 sessile, 2-celled, ca. 1.5 mm broad, 1 mm high, the anther cells filling only a small part, introrse; stamens of whorl II narrower than those of whorl I, ca. 1 × 1 mm, 2-celled, introrse; the stamens of whorl I and II laminar; inner 3 stamens triangular-columnar, ca. 1 mm long, 4-celled, the cells in two pairs, the lower pair extrorse, the upper pair lateral-extrorse; glands present at the base of the inner 3 stamens, globose; staminodia not seen; pistillode ca. 1 mm long, glabrous; receptacle urceolate, pubescent inside. Pistillate flowers with tepals as in male flowers; staminodia 9; the outer 3 slightly broader than those of whorl II, but not as dissimilar as in male flowers, inner 3 columnar, all staminodes a little smaller than the stamens; remnants of anther cells same number as anther cells in stamens; glands small, globose; pistil glabrous, ca. 2 mm long; receptacle urceolate, pubescent inside. Young fruits fully enclosed in the receptacle. Fruit ellipsoid, ca. 3 cm long; cupules deeply cup-shaped, 2 × 1 cm; pedicels ca. 1 cm long, thickened, abruptly widened in the cupule.

Phenology. Flowers: August. Fruits: April.

Habitat. Terra firme forest on clay soil.

This new species straddles the fence between *Endlicheria* and *Rhodostemonodaphne.* These two genera differ only in their stamens, which are 2-celled in *Endlicheria* and 4-celled in *Rhodostemonodaphne*, a character of questionable validity in recognizing genera (Rohwer et al., 1991; van der

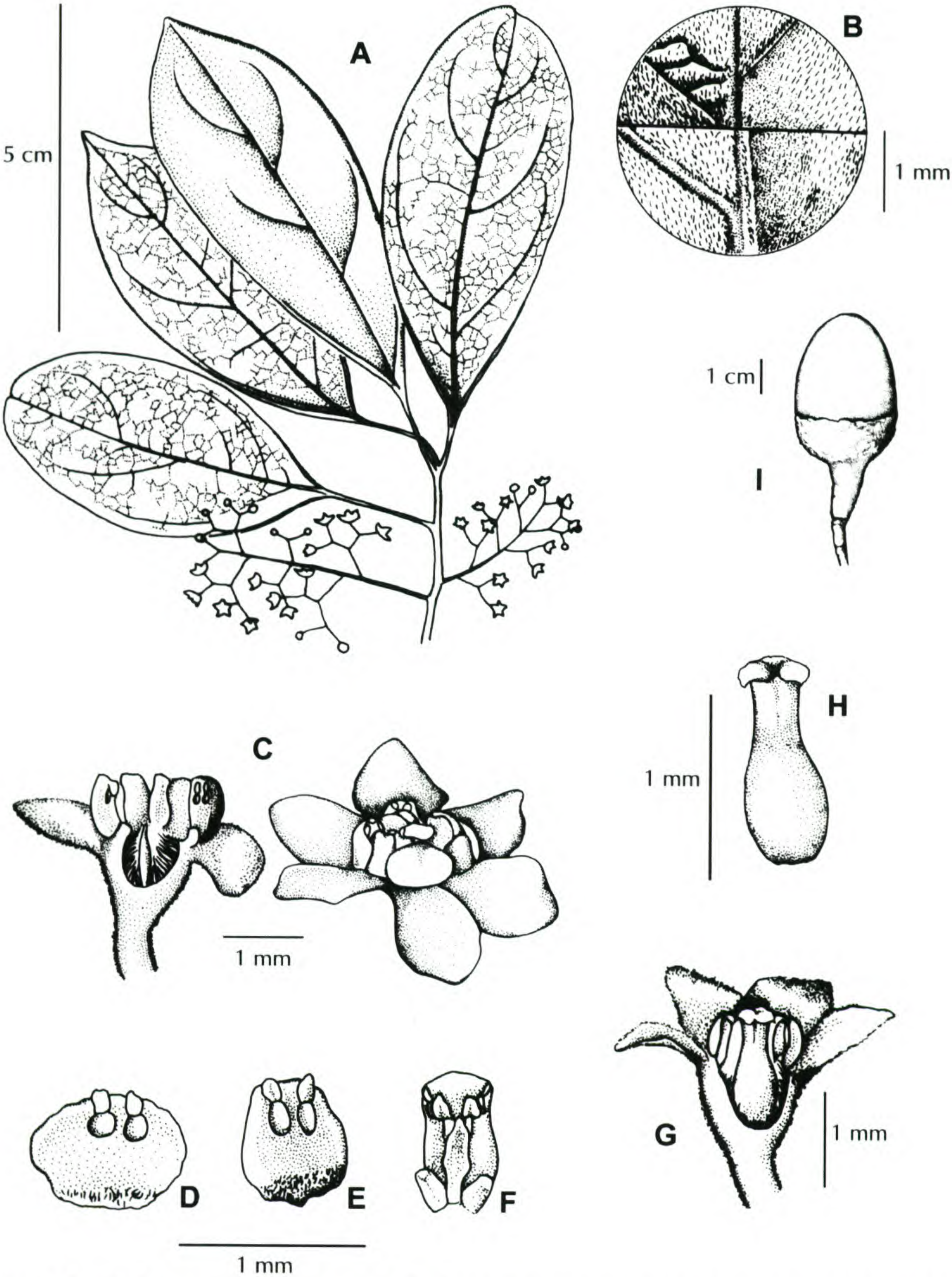


Figure 14. *Rhodostemonodaphne recurva* van der Werff. —A. Habit. —B. Details of the upper (at top) and lower leaf surfaces. —C. Staminate flowers. —D. Stamen of whorl I. —E. Stamen of whorl II. —F. Stamen of whorl III. —G. Pistillate flower. —H. Pistil. —I. Fruit. (A–F from holotype *Vicentini et al. 653*; G, H from *sine coll., PDBFF Reserva 3304, tree 3094*; I from *Rodrigues 6903*.) Drawn by Angelic Katz Nara.

Werff & Richter, 1996). The 2-celled outer 6 stamens point to *Endlicheria*, while the 4-celled inner 3 stamens indicate *Rhodostemonodaphne*. Indeed, both *E. anomala* (Nees) Mez and *R. revolutifolia* Madriñan have six 2-celled and three 4-celled stamens. However, broad, sessile stamens occur frequently in *Rhodostemonodaphne* and not or rarely in *Endlicheria*; broad, sessile stamens are found in *E. rubriflora* Mez, a species only placed in *Endlicheria* because of its 2-celled stamens. The indument of twigs and leaves and the leaf venation of *R. recurva* resemble species of *Rhodostemonodaphne* such as *R. grandis* (Mez) Rohwer and related species and *R. capixabensis* Baitello & Coe Teixeira. This similarity led me to place the new species in *Rhodostemonodaphne*. Possibly the closest relationship is with *R. revolutifolia* Madriñan, which has the same stamen configuration, but which differs in having erect hairs on the lower leaf surface and larger leaves. Vegetatively, *R. recurva* is quite similar to *R. peneia* Madriñan, and both species occur near Manaus. They can be separated as follows: *R. recurva* has recurved leaf margins, densely pubescent twigs (with the surface completely covered by the indument), and 3 or 4 lateral veins, while *R. peneia* has flat leaf margins, sparsely pubescent twigs with the surface largely visible, and usually 5 to 7 lateral veins (rarely fewer).

Paratypes. BRAZIL. **Amazonas:** Manaus, Estrada AM-10, km 120 (fl), *Rodrigues & Loureiro 7178* (INPA); Reserva Florestal Ducke, 2°53′S, 59°58′W (fr), *Rodrigues & Osmarino 6903* (INPA); Distrito Agropecuário da Suframa, Fazenda Esteio, Reserva 1202 of the PDBFF project, 2°24′S, 59°52′W (fl), tree 5767, *Santos et al. s.n.* (INPA, MO), (fl), tree 5767, *sine coll. s.n.* (INPA, MO), Reserva 3304 (fl), tree 3094, *sine coll. s.n.* (INPA, MO); Fazenda Dimona, Reserva 2108 of the PDBFF, 2°19′S, 60°05′W (fl), tree 35, *Mackenzie et al. s.n.* (INPA, MO).

Key to the Species of *Ocotea* of the Ducke Reserve

The key to the *Ocotea* species presented here includes all species of *Ocotea* known from the Ducke Reserve for which flowering material was available, plus two new species, *O. ligulata* and *O. obliqua*, which occur in the surrounding area, but which have not been found in the Ducke Reserve. For a brief description and photographs (especially of vegetative characters) of all the species included in the key (plus additional *Ocotea* species), refer to the field guide of the vascular plants of Ducke Reserve (Vicentini et al., 1999). Descriptions of the species not described in this article will be published in the Lauraceae treatment of the *Flórula of the Reserva Ducke* (in prep.).

Identifying Lauraceae to species is very difficult without flowering specimens, except for a few striking species. The majority of the species of *Ocotea* in the area under study are dioecious, and the key is based on staminate flowers, although it may be possible to identify specimens with pistillate ones. For fruiting specimens refer to the above-mentioned field guide, which includes photographs of the fruits of some species and may narrow the decision-making process. To use the following key a good dissecting microscope is needed; some floral or pubescence characters (for instance, the indument on *O. scabrella*) are not visible to the unaided eye.

Vegetative characters, such as indument of twigs and leaves, as well as characters of the pistillode and cupule, can greatly help in the identification. Because these characters are not always mentioned in the key, we present them in Table 1 (pp. 284, 285) for nine of the new *Ocotea* species and four earlier described species with which the new species have been confused. Not included in Table 1 are *Ocotea ligulata* and *O. immersa*; these species are so distinct that confusion with other species seems unlikely. Type material of *O. amazonica* (*Poeppig 3037B*, B) and *O. petalanthera* (*Poeppig 2426*, B) has been used in making Table 1. While we found several collections matching the type of *O. amazonica* closely, we did not find other collections of *O. petalanthera*, and that species is to us only known from the type. Therefore, not all character states for this species could be entered in Table 1. Whether *O. bofo* and *O. rubrinervis* are distinct species is not clear. One of us (HW) assumes that the two are conspecific. Type material of *O. rubrinervis* (*Poeppig 4580*, B) has been studied in preparing Table 1, but the name *O. bofo*, the older name, has been used.

Two unidentified species were included in key as *Ocotea* sp. E and *O.* sp. G, following the names used in the field guide for the vascular plants of the Ducke Reserve (Vicentini et al., 1999). Both are probably new species, but good fertile material was not available. *Ocotea* sp. E (e.g., *Assunção 576, 581* and *Vicentini 1189, 950, 959, 960*; INPA, MO, SP) is apparently related to the *Ocotea cernua* complex (Rohwer, 1986), because the filaments of the outer stamens are as in this complex partly fused with the tepals. The fruits are also very similar to those of the *O. cernua* group (cupule cup-shaped and enclosing the berry up to ca. 1/3 of its length; refer to Vicentini et al., 1999). However, terminal buds on *O.* sp. E are completely glabrous, which is not the case in the *Ocotea cernua* complex, or in the majority of Lauraceae. *Ocotea* sp. G (e.g., *Assunção 528* and *Ribeiro 905, 927*; INPA, MO, SP) keys out to *O. schomburgkiana* in Rohwer's (1986) treatment, but *O.* sp. G is not, as the latter, a shrub or treelet with domatia in the axils of lateral veins.

1a. Lower leaf surface completely covered by a silvery or golden appressed indument, i.e., lamina surface not visible.
  2a. Leaves with a vernation line almost parallel to the midrib; secondary veins hidden by indument; leaves sessile or nearly so (petiole < 0.5 cm) . . . . . *O. guianensis* Aublet
  2b. Leaves without vernation line; secondary veins prominent and not hidden by indument; petiole ≥ 1 cm . . . . . *O. argyrophylla* Ducke
1b. Lower leaf surface glabrous, erect pubescent or with appressed hairs, but then surface of lamina still visible.
  3a. Domatia, i.e., cavities or tufts of hairs, in the axils of secondary veins (check carefully on several leaves).

4a. Domatia a glabrous cavity, prominent on the upper leaf surface, usually present only on the most basal pair of secondary veins . . . . . *O. douradensis* Vattimo-Gil
4b. Domatia hairy, or if glabrous inconspicuous on the upper surface.
5a. Twigs and petioles covered by a rusty dense indument of erect hairs, these also on the lower leaf surface, at least on the midrib . . . . . *O. percurrens* Vicentini
5b. Indument of twigs and petioles absent or consisting of sparse, appressed or very short hairs, but surface always visible.
6a. Flowers ca. 5 mm diam.; pistillode glabrous; receptacle pubescent in staminate and glabrous in pistillate flowers . . . . . *O. cinerea* van der Werff
6b. Flowers ca. 3 mm diam.; both pistillode and receptacle either glabrous or pubescent.
7a. Pistillode glabrous; receptacle glabrous or nearly so in both staminate and pistillate flowers.
8a. Reticulation coarse and (usually) white and very conspicuous due to the contrasting dull blackish lamina when dried . . . . . *O. nigrescens* Vicentini
8b. Reticulation fine, not white or differently colored from the lamina, the leaves usually drying green . . . . . *O. subterminalis* van der Werff
7b. Pistillode pubescent; receptacle pubescent in both staminate and pistillate flowers . . . . . *O. minor* Vicentini
3b. Domatia absent.
9a. Lower leaf surface with a moderate to dense indument of erect (or crisped) hairs, usually also on the petiole and branchlets.
10a. Leaves chartaceous; usually also pubescent on the veins above; the hairs long and conspicuous and soft to the touch.
11a. Shrub or treelet; petioles short (ca. 5 mm); leaf base cordate or rounded; branchlets slender (< 3 mm diam.) . . . . . *O. boissieriana* (Meisner) Mez
11b. Tree; petioles longer (> 10 mm); leaf base acute or obtuse; branchlets stout (ca. 5 mm diam.) . . . . . *O. tabacifolia* Rohwer
10b. Leaves coriaceous; glabrous on the veins above; indument short or very short.
12a. Leaves usually waxy beneath; pistillode absent or reduced to a tuft of hairs; receptacle pubescent inside; staminodes present, stipitiform and pubescent . . . . . *O. rhodophylla* Vicentini
12b. Leaves not waxy; pistillode present, glabrous, with or without a stigma; receptacle glabrous inside; staminodes absent . . . . . *O. amazonica* (Meisner) Mez
9b. Lower leaf surface glabrous, or with appressed hairs, or with sparse and extremely short erect hairs, these not visible to the naked eye.
13a. Terminal bud glabrous or hairy only on the inner surface of the bud scales (externally glabrous).
14a. Twigs angular or winged; receptacle glabrous in staminate flowers.
15a. Leaf apex attenuate to acuminate; lamina narrowly elliptic, usually > 15 cm long and 3–4.5 times longer than wide . . . . . *O. olivacea* A. C. Smith
15b. Leaf apex rounded to short acuminate; lamina broadly elliptic, usually < 15 cm long and ca. 2 times longer than wide . . . . . *O. neblinae* C. K. Allen
14b. Twigs cylindrical or soon becoming so; receptacle pubescent in staminate flowers.
16a. Bud scales free, revealing the pubescent inner surface (and margin), leaving clusters of scars on the twigs (at the end of each growth unit); filaments of outer stamens ca. half as long as anthers and free . . . . . *O. myriantha* (Meisner) Mez
16b. Buds completely glabrous (bud scales closed, not showing the inner surface and not leaving conspicuous scars on twigs); anthers of outer stamens sessile, the filaments partially fused to the tepals . . . . . *O.* sp. E
13b. Terminal buds pubescent, usually completely covered by indument.
17a. Flowers hermaphroditic, i.e., ovary well defined and distinct from style, bearing an ovule inside (some species present hermaphroditic and pistillate flowers).
18a. Tepals papillose on the inner surface; staminodes of whorl IV present.
19a. Connectives of outer stamens extended above thecae, forming sterile tips; leaves glabrous or nearly so.
20a. Stamens papillose, ca. 2 mm long . . . . *O. ligulata* van der Werff
20b. Stamens glabrous, ca. 1 mm long . . . . . *O. rhynchophylla* (Meisner) Mez
19b. Connectives without sterile tips; leaves with appressed hairs beneath . . . . . *O. aciphylla* (Nees) Mez
18b. Tepals not papillose; staminodes of whorl IV absent.
21a. Leaf apex obtuse or rounded; base narrowed and decurrent on the petiole; leaves glabrous or nearly so . . . . . *O. immersa* van der Werff
21b. Leaf apex acuminate; base acute and not decurrent on the petiole; lower leaf surface with moderate to dense indument of appressed hairs . . . . . *O. oblonga* (Meisner) Mez

17b. Flowers unisexual, i.e., when pistillode evident with a conspicuous stigma, then ovary without an ovule inside.
22a. Whorl III of stamens close together forming a tube surrounding the pistillode; these filaments fused, at least at the base; pistillode as high as stamens and stigma positioned between the anther apices.
23a. Pistillode pubescent, at least on the style; twigs usually with persistent bracts and covered by an erect rusty indument . . . . . *O. cujumari* Martius
23b. Pistillode glabrous; twigs without persistent bracts, glabrous or with appressed whitish hairs.
24a. Twigs strongly angular to winged, not lenticellate; leaves large (> 15 cm) with raised reticulation and appressed hairs; filaments ca. half as long as anthers . . . . . *O. longifolia* HBK
24b. Twigs angular, soon terete, densely lenticellate; leaves smaller with inconspicuous reticulation and glabrous; filaments as long as anthers . . . . . *O. nitida* (Meisner) Rohwer
22b. Whorl III of stamens not forming a tube surrounding the pistillode, or if so, then filaments free and pistillode shorter than stamens and included in the tube.
25a. Filaments of outer stamens ca. half as long as anthers or shorter, free or partly fused to the tepals.
26a. Leaf base cordate or rounded and petiole < 0.8 cm long; pistillode reduced without a stigma *O. adenotrachelium* (Nees) Mez
26b. Leaf base not cordate or rounded, or if so, then petiole > 1.5 cm long or pistillode with a conspicuous stigma.
27a. Filaments of outer 6 stamens partly fused with the tepals; pistillode without or with a stigma.
28a. Pistillode present, stipitiform and pubescent; petiole < 1 cm long; leaves < 9 × 2.5 cm *O. minor* Vicentini
28b. Pistillode absent or present but glabrous; petiole > 1.5 cm long; leaves > 6 × 2.8 cm.
29a. Lower thecae of outer stamens introrse . . . . . *O. cernua* (Meisner) Mez
29b. Lower thecae of outer stamens latrorse to latrorse-introrse . . . . . *O. pauciflora* (Nees) Mez
27b. Filaments of outer 6 stamens free; pistillode well developed with a stigma.
30a. Staminodes of whorl IV present, stipitiform and pubescent . . . . . *O. cinerea* van der Werff
30b. Staminodes of whorl IV absent.
31a. Leaves, inflorescences, and twigs with appressed hairs; inflorescence branches densely appressed pubescent, obscuring surface; pistillode pubescent or glabrous.
32a. Pistillode pubescent . . . . . *O. splendens* (Meisner) Baillon
32b. Pistillode glabrous or nearly so . . . . . *O. leucoxylon* (Swartz) Mez s.l.
31b. Leaves, inflorescences, and twigs glabrous or with short erect hairs, the pubescence moderate to sparse; pistillode glabrous or nearly so.
33a. Reticulation coarse and (usually) white and very conspicuous due to contrasting dull blackish lamina when dried . . . . . *O. nigrescens* Vicentini
33b. Reticulation fine, not white or differently colored than lamina (drying reddish, brown, or greenish).
34a. Leaves usually drying green; inflorescence branches and flowers externally moderately covered with short erect hairs . . . . . *O. subterminalis* van der Werff
34b. Leaves usually drying red-brown; inflorescence branches and flowers glabrous or only with a few and extremely short, minute, erect hairs . . . . . *O.* sp. G

25b. Filaments of outer stamens clearly longer than or as long as the anthers and completely free.
35a. Twigs with erect or crisped hairs, sometimes extremely short and sparse (use a microscope and look closely at the terminal bud).
36a. Indument on twigs ferrugineous, grayish, or brownish, dense, the surface scarcely visible.
37a. Leaves sub-tripliveined; glands of inner stamens flat . . . . . *O. delicata* Vicentini
37b. Leaves pinnately veined; glands of inner stamens globose.
38a. Receptacle glabrous in both staminate and pistillate flowers . . *O. amazonica* (Meisner) Mez
38b. Receptacle pubescent in both staminate and pistillate flowers.
39a. Pistillode reduced to a tuft of hairs or absent; staminodes of whorl IV present . . . . . *O. rhodophylla* Vicentini
39b. Pistillode present, glabrous, without stigma; staminodes usually absent . . . . . *O. obliqua* Vicentini
36b. Indument on twigs whitish or minute and leaving surface largely visible.
40a. Flowers externally glabrous or nearly so; tepals at anthesis erect . . . . . *O. puberula* (Richard) Nees
40b. Flowers externally pubescent; tepals at anthesis spreading to reflexed.
41a. Small tree or shrub, to 10 m. Inflorescences in the axils of leaves, flowers almost sessile and arranged in dense glomerules; tepals pubescent on both surfaces . . . . . *O. scabrella* van der Werff
41b. Tree to 20 m. Inflorescences in the axils of bracts near the tips of the branches and appearing terminal (rarely in the axil of normal leaves); flowers pedicellate and not arranged in dense glomerules; tepals pubescent only on outside . . . . . *O. subterminalis* van der Werff
35b. Twigs with appressed hairs, or completely glabrous.
42a. Leaf apex obtuse or rounded . . . *O. immersa* van der Werff
42b. Leaf apex acuminate or acute.
43a. Twigs completely covered by appressed hairs, indument usually dense to moderate on the lower surface of mature leaves, rarely sparse.
44a. Leaves strongly coriaceous, > 15 cm long, with fine reticulation; staminodes of whorl IV present . . . . . *O. matogrossensis* Vattimo
44b. Leaves chartaceous, usually < 10 cm long, with coarse reticulation; staminodes of whorl IV absent . . . . . *O. oblonga* (Meisner) Mez
43b. Twigs and the lower surface of mature leaves glabrous or nearly so.
45a. Flowers larger (> 4.5 mm diam. at anthesis); pistillode entirely pubescent . . . . . *O. floribunda* (Swartz) Mez
45b. Flowers smaller (≤ 4 mm diam. at anthesis); pistillode glabrous or nearly so . . . . . *O. ceanothifolia* (Nees) Mez

Acknowledgments. We thank the British Department for International Development (DFID) and the Instituto Nacional de Pesquisas da Amazônia (INPA) which supported the "Flora da Reserva Ducke" project. DFID sponsored the visits of the second author to St. Louis in 1997 and of the first author to Manaus in 1998. We are grateful to the entire "Flora da Reserva Ducke" project team, especially to Paulo C. L. Assunção, Everaldo da C. Pereira, and Cosmo F. da Silva for gathering excellent material of the species here described by monitoring tagged trees in the field. We thank Mike Hopkins for his brillant work in coordinating this project and the curators of INPA, B, and NY for loans of their specimens. The fine illustrations were drawn by Angelic Katz

Nara (Figs. 2–5, 7–12, 14) and Alba L. Arbelaez (Figs. 1, 6, 13).

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Volume 10, Number 3, pp. 187–298 of NOVON was published on 12 September 2000.

Volume 10
Number 4
2000

NOVON

A Synopsis of the Genus *Blakea* (Melastomataceae) in Mexico and Central America

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ABSTRACT. A regional synopsis of the genus *Blakea* is presented that recognizes 33 species in Mexico and Central America. This summary includes a key, distributional and phenological information, notes on morphological variation, and discussions that provide rationale for relegating six binomials to synonymy. Descriptions and diagnoses are presented for four new species of *Blakea* (*B. coloradensis*, *B. darcyana*, and *B. perforata* from Panama; and *B. wilsoniorum* from southern Costa Rica and Panama). Analysis of the type specimens and recently collected flowering material of *Topobea storkii* necessitates its transfer to *Blakea*. Three other species (*B. cuatrecasii*, *B. repens*, and *B. subconnata* var. *obtusa*), all of which were previously known from Andean South America, are reported from Panama for the first time.

Blakea, with approximately 100 species, is one of two berry-fruited genera comprising the natural neotropical tribe Blakeeae (Almeda, 1990). It is best represented in wet montane regions from southern Mexico and the West Indies to Bolivia and Brazil. Although northwestern South America is undoubtedly the center of species richness for *Blakea* (Wurdack, 1973), southern Central America is clearly the area of focal importance for unusual diversity in floral morphology. This floral diversity reflects adaptations to a broad array of important pollinators in the region, including rodents, buzzing bees, and hummingbirds (Almeda, 1990; Lumer, 1981; Lumer & Schoer, 1986). For a woody genus with showy, often spectacular, flowers, it is surprising that *Blakea* has escaped the attention of serious students until recently. The genus has not been treated in its entirety since Cogniaux's (1891) familial monograph. Even the most recent floristic treatments of the family Melastomataceae for the Mesoamerican region appeared over 30 years ago (Gleason, 1958; Standley, 1924, 1938; Standley & Williams, 1963; Winkler, 1965) when many areas were still little-explored and poorly known botanically.

The account presented here is a precursor to the treatment that will appear in *Flora Mesoamericana*. Four new species and one new generic transfer are proposed in the context of a regional synopsis. This summary also includes a key to the 33 recognized species, distributional and phenological information, notes on variation, and discussions that provide rationale for relegating previously recognized species to synonymy.

TAXONOMIC TREATMENT

Blakea P. Browne, Civ. Nat. Hist. Jamaica 323. 1756. TYPE: *Blakea trinervia* P. Browne.

Trees, shrubs, or woody vines, often epiphytic with glabrous or variously pubescent, terete or quadrate branchlets. Leaves thick and coriaceous or chartaceous, 3- to 5-nerved or -plinerved with the transverse secondary veins (when evident) closely spaced, straight, and parallel. Flowers 6-merous, axillary, solitary or fascicled, typically pedunculate in the upper leaf axils and subtended by two pairs of decussate, free or variously fused, coriaceous or foliaceous, sessile bracts inserted at the base of the hypanthium. Hypanthia campanulate or

hemispheric; calyx persistent or deciduous, rarely calyptrate, truncate or 2- to 6-lobate. Petals 6, white, pink, magenta, red, or some combination of these colors, glabrous but often marginally ciliolate. Stamens 12, isomorphic and glabrous; anthers oval, oblong, or elliptic, laterally compressed, bluntly obtuse, obconic, or broadly rounded at the summit, free or laterally connate with two typically well-separated apical pores; connective thickened and unappendaged or dilated basally into a dorsal deflexed, horizontal, or upturned spur. Stigma punctiform to capitate. Ovary inferior, usually 6-locular. Fruit baccate; seeds ovoid, clavate, or narrowly pyriform, testa smooth.

Blakea and the closely related genus *Topobea* are the only two genera comprising the tribe Blakeeae. This tribe is characterized by axillary flowers that are individually subtended by two pairs of decussate bracts, baccate fruits, ovoid to pyramidal, smooth seeds, and wood with multiseriate rays and the frequent occurrence of druses (Almeda, 1990). Flowering material is essential for the unequivocal generic placement of species in this tribe. In *Blakea*, each flower has 12 stamens; the anthers are biporose, oval, oblong, or elliptic, compressed laterally, bluntly obtuse or broadly rounded apically with two typically well-separated (typically minute) pores. In *Topobea* the flowers also commonly have 12 stamens, although several hexandrous and one octandrous species occur in Costa Rica and Panama; the anthers of *Topobea*, in contrast to those of *Blakea*, are uniporose or biporose, linear-oblong to oblong-subulate or rostrate, usually not compressed laterally, and with approximate or confluent dorsally inclined broad pores.

The posture and orientation of stamens and the shape, length, and degree of fusion of floral bracts are important diagnostic characters in *Blakea*. Pressing and drying often conceal these features, frequently necessitating a dissection of hydrated material. This is especially important when analyzing the species with large enveloping foliaceous floral bracts. Because of the prevalence of epiphytism in *Blakea*, coupled with the local distribution of many taxa, it seems likely that additional species will be discovered as forest canopies and remote areas are explored. Inadequate material of several collections from Costa Rica and Panama probably represent additional species for the area covered by this study. Their identity will require evaluation when better material is collected.

Key to the Species of *Blakea* in Mexico and Central America

1a. Flowers always pendent, petals imbricate or convolute when fully expanded to form a subcylindric tube-like corolla concealing the stamens, which form a ring around the straight style.
  2a. Petals uniformly pink or magenta; floral bracts and calyx lobes red in color . . . . . 14. *B. fuchsioides*
  2b. Petals green or green flushed with purple or reddish at the base; floral bracts and calyx lobes not red in color.
    3a. Leaf blades modified adaxially at the petiole-laminar junction into flap-like saccate pouches, the basal and lateral margins of which are free from but conspicuously decurrent on the petiole.
      4a. Pubescence of uppermost internodes consisting of hairs 1–2 mm long; leaf blades bluntly denticulate; outer floral bracts linear-lanceolate, 15–21 mm long, equaling or exceeding the calyx lobes at anthesis; Costa Rica (Cerro Chompipe, Volcán Barva, and Volcán Irazú) . . . . . 2. *B. austin-smithii*
      4b. Pubescence of uppermost internodes consisting of hairs mostly less than 0.5 mm long; leaf blades entire; outer floral bracts ovate to elliptic-ovate, 5.5–9 mm long, conspicuously shorter than the calyx lobes at anthesis; Costa Rica (Cordillera de Tilarán, Cordillera de Guanacaste) . . . . . 5. *B. chlorantha*
    3b. Leaf blades not modified adaxially at the petiole-laminar junction into flap-like saccate pouches.
      5a. Older petioles, floral peduncles, and bracts essentially glabrous, outer floral bracts 13–17 mm wide on fruiting hypanthia; Costa Rica (Cordillera de Talamanca and Volcán Barva) . . . . . 23. *B. peduliflora*
      5b. Older petioles, floral peduncles, and bracts moderately to copiously covered with appressed or spreading brown hairs; outer floral bracts 5–9 mm wide on fruiting hypanthia.
        6a. Uppermost internodes and elevated primary nerves on abaxial leaf surfaces moderately to densely covered with spreading brown hairs less than 0.5 mm long; floral peduncles (2.0–)2.8–3.8 cm long; outer floral bracts 1.3–2.0 cm long; Mexico (Chiapas) and western Guatemala (Quezaltenango and San Marcos) . . . . . 25. *B. purpusii*
        6b. Uppermost internodes and elevated primary nerves on abaxial leaf surfaces densely covered with appressed brown hairs 1–2.5 mm long; floral peduncles 1.2–2.0 mm long; outer floral bracts 0.7–0.8 cm long; western Panama (Chiriquí) . . . . . 17. *B. gregii*

1b. Flowers erect or antrorsely divergent but never truly pendent, petals white, pink, magenta, red, or some combination of these colors, the petals well separated from one another or connivent when fully expanded but never forming a tube-like corolla that conceals the stamens.

7a. Calyx lobe apex elaborated into a deflexed ovate to cordate foliaceous appendage; style glandular-puberulent; cauline nodes lacking stipuliform setose flaps.
8a. Leaf blades (12.2–)19–35 × (10–)17–35.5 cm, cordate to ovate-orbicular; petioles 4.5–11.2 cm long; floral peduncles 0.7–1.6 cm long; anther sacs free from one another but connivent in a ring around the style . . . . . 31. *B. tuberculata*
8b. Leaf blades (6.3–)10.3–20.7 × 5.2–10.3 cm, elliptic to elliptic-ovate; petioles 1.5–3.7 cm long; floral peduncles 0.4–0.9 cm long; anther sacs laterally connate in a ring around the style . . . . . 4. *B. calycosa*
7b. Calyx lobe apex not elaborated into a foliaceous appendage; style glabrous, or if glandular-puberulent, then uppermost cauline nodes bearing stipuliform setose flaps.
9a. Inner and outer floral bracts essentially free to the base.
10a. Adaxial leaf surface copiously covered with smooth or gland-tipped hairs; calyx lobes filiform . . . . . 32. *B. wilburiana*
10b. Adaxial leaf surface essentially glabrous; calyx lobes not filiform.
11a. Leaves at a node strongly dimorphic in size.
12a. Leaf blades subpeltate at the base, lacking inconspicuous domatia in the angles between the median vein and each of the two innermost veins on the abaxial surface . . . . . 18. *B. guatemalensis*
12b. Leaf blades not subpeltate at the base, inconspicuous domatia (these often ruptured) typically formed in the angles between the median vein and each of the two innermost veins on the abaxial surface . . . . . 13. *B. foliacea*
11b. Leaves at a node not strongly dimorphic in size.
13a. Leaves sessile, auriculate to cordate-clasping at the base . . . . . 12. *B. elliptica*
13b. Leaves petiolate, not auriculate or cordate-clasping at the base.
14a. Outer floral bracts distinctly shorter than the hypanthium.
15a. Calyx fused and concealing petals in bud but rupturing at anthesis into 3–4 persistent or tardily deciduous lobes . . . . . 1. *B. anomala*
15b. Calyx lobes not fused and concealing petals in bud.
16a. Leaf blades bearing irregularly rupturing domatia in the angles between the median vein and each of the two proximal lateral veins on the abaxial surface; floral peduncles 1.3–4.8 cm long.
17a. Calyx lobes obsolete or evident only as depressed deltoid undulations; anther thecae laterally connate . . . . . 22. *B. pauciflora*
17b. Calyx lobes broadly ovate, 1–1.5 mm long and 2.5–3.5 mm wide basally; anther thecae free . . . . 19. *B. hammelii*
16b. Leaf blades lacking irregularly rupturing domatia in the angles between the median vein and each of the two proximal lateral veins on the abaxial surface; floral peduncles 0.5–1.2 cm long . . . . . 20. *B. herrerae*
14b. Outer floral bracts equaling or exceeding the hypanthium in length.
18a. Calyx consisting of a truncate flange, the lobes obsolete or merely low undulations.
19a. Floral peduncles 0.9–1.2 cm long; anther thecae free . . . . . 11. *B. darcyana*, sp. nov.
19b. Floral peduncles 2.1–4.2 cm long; anther thecae laterally connate.
20a. Petals white with a flush of pink on the abaxial margins; anthers yellow, the apex rounded; hypanthium somewhat to markedly costulate in post-anthesis . . . . . 15. *B. gracilis*
20b. Petals pink throughout; anthers pink or pale yellow-white, the apex bluntly obconic; hypanthium terete and smooth in post-anthesis . . . . . 21. *B. litoralis*
18b. Calyx consisting of well-defined lobes.
21a. Uppermost branchlet nodes bearing setose stipuliform flaps 1–2 × 4–6 mm; style glandular-puberulent . . . . . 26. *B. repens*
21b. Uppermost branchlet nodes lacking setose stipuliform flaps; style glabrous.
22a. Uppermost internodes quadrangular with carinate angles and interpetiolar ridges created by the basally vaginate petioles; leaf base acute to obtuse with the innermost pair of primary veins usually poculate-coalesced with the median vein on the abaxial surface . . . . . 29. *B. subconnata* var. *obtusa*
22b. Uppermost internodes essentially terete; leaf base obtuse to rounded with inconspicuous domatia (these often ruptured) typically formed in the angles between the median

vein and each of the two innermost primary veins and sometimes in the angle of the outermost lateral veins as well on the abaxial surface . . . . . 13. *B. foliacea*

9b. Inner and/or outer floral bracts partially fused to completely fused for their entire length.

23a. Leaves sessile, auriculate to cordate-clasping at the base . . . . . 12. *B. elliptica*

23b. Leaves petiolate, neither auriculate nor cordate-clasping at the base.

24a. Nodes of upper branchlets swollen and often bearing small holes 1–2 mm diam. on the leaf scars that lead to domatia presumably occupied by ants . . . . . 24. *B. perforata*, sp. nov.

24b. Nodes of upper branchlets not as above.

25a. Calyx fused and concealing petals in bud, the calyptra or lobes ultimately deciduous.

26a. Calyx calyptrate and falling away as a unit; the prominently lobed floral bracts superficially resembling the calyx; anthers 9.5–10 × 6–7 mm . . . . . 7. *B. costaricensis*

26b. Calyx rupturing at anthesis into two to six ovate-oblong deciduous lobes, ultimately leaving a truncate flange or tube on fruiting hypanthia; anthers 5–7 × 2–4 mm.

27a. Flowers essentially sessile; petals 2–2.2 × 1.4–1.8 cm; anthers laterally connate, 5 × 2 mm . . . . . 8. *B. crinita*

27b. Floral peduncles 0.9–3 cm long; petals 3.5–5.3 × 3–4 cm; anthers free, 7 × 3.5–4 mm . . . . . 3. *B. brunnea*

25b. Calyx not fused and not concealing petals in bud, or if calyx is fused in bud, then the lobes rupturing regularly and persisting on fruiting hypanthia.

28a. Inner floral bracts free to the base; anther thecae laterally connate for at least half of their length . . . . . 9. *B. cuatrecasii*

28b. Inner floral bracts fused basally for at least half of their length; anther thecae free.

29a. Petals brilliant red with a small white band at the base; anther connective prolonged dorsally into an upturned spur 3–5 mm long . . . . . 27. *B. scarlatina*

29b. Petals white, pink, or some combination of these colors; anther connective not prolonged dorsally into an acute spur.

30a. Inner floral bracts connate for essentially their entire length to form a cupulate truncate collar that closely envelops the hypanthium.

31a. Outer floral bracts fused for half or more of their length and closely enveloping inner floral bracts and the hypanthium; fruiting hypanthia 1.5–2 cm long.

32a. Outer floral bracts exceeding the inner floral bracts in length and typically concealing them on flowering and fruiting hypanthia; peduncles on fruiting hypanthia 1.2–2 cm long . . . 33. *B. wilsoniorum*, sp. nov.

32b. Outer floral bracts somewhat shorter than the inner floral bracts, the distal portion of inner bracts visible on flowering and fruiting hypanthia; peduncles on fruiting hypanthia 2.5–5 cm long . . . . . 28. *B. storkii*

31b. Outer floral bracts fused for less than half of their length, the lobes spreading and not closely enveloping inner floral bracts or the hypanthium; fruiting hypanthium 0.5–0.7 cm long . . . . . 6. *B. coloradensis*, sp. nov.

30b. Inner floral bracts connate for only a portion of their length to form a 2-lobed collar that only partially envelops the hypanthium.

33a. Floral peduncles (1.5–)2.7–4 cm long; petals 2.8–3.8 × 2–3.2 cm, white only flushed with pink apically and along the margins . . . . . 16. *B. grandiflora*

33b. Floral peduncles 0.4–1.2 cm long; petals 1.5–2.5 × 0.7–1.8 cm, entirely pink or white.

34a. Uppermost nodes beset with an interpetiolar tuft of coarse hairs that falls away to leave a distinct interpetiolar ridge or line; leaf blades not white-punctulate adaxially when dry; outer floral bracts fused basally for 3–6 mm; petals white; Costa Rica . . . . . 30. *B. tapantiana*

34b. Uppermost nodes not beset with an interpetiolar tuft of coarse hairs that falls away to leave a distinct

interpetiolar ridge or line; leaf blades white puncticulate adaxially when dry; outer floral bracts fused basally for 7–10 mm; petals pink; Belize, Guatemala, and Honduras . . . . . 10. *B. cuneata*

1. Blakea anomala Donnell Smith, Bot. Gaz. 42: 297. 1906. TYPE: Costa Rica. San José: In truncis putridis ad La Palma, 1450–1550 m, Sep. 1896, *Pittier 10165* (syntype, US; isosyntypes, BR, CR, NY); Costa Rica. San José: In truncis putridis ad La Palma, 1450–1550 m, Sep. 1896, *Tonduz 12521* (syntype, US; isosyntype, NY).

Distribution and phenology. Endemic to Costa Rica where it can be locally common in cloud forests of the Cordillera Central and Cordillera de Talamanca at 700–1800(–2400) m. Collected in flower from September through April, fruiting into August.

Blakea anomala is readily recognized by its irregularly rupturing calyx, small scalelike floral bracts, and laterally connate anthers. This species exhibits two modal tendencies with respect to pubescence and shape of the leaf base. The syntypes (*Pittier 10165* and *Tonduz 12521*) have copiously setose-furfuraceous upper internodes with leaves that also have varyingly persistent pubescence abaxially, and leaf bases that are subcordate to rounded. This form varies through a series of less pubescent intermediates to individuals that are nearly glabrous or at most scurfy puberulent on vegetative buds with leaves that are mostly basally acute. The glabrous populations also have conspicuous elevated interpetiolar ridges on the uppermost twigs, but these are lacking or not readily evident in the pubescent populations represented by the syntype material cited herein. Judging from available collections examined for this study, the glabrous variant is the more widespread form. The differences exhibited by these two extremes do not seem to correlate with other characters, nor do they appear to be correlated with geographic or elevational differences. The extremes when compared side by side are impressive, but they are bridged by many intermediates that make formal taxonomic recognition pointless and arbitrary. Therefore, the species as recognized here is considered variable and polymorphic. Perhaps the observed differences are the result of repeated hybridization between two formerly distinct entities.

2. Blakea austin-smithii Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 1561. 1938. TYPE: Costa Rica. Alajuela: Palmira, 2200 m, Mar. 1938, *A. Smith H382* (holotype, F; isotype, MO).

Distribution and phenology. Endemic to Costa Rica where it is largely restricted to cloud forests on slopes of the Cordillera Central at 1500–2400 m. Collected in flower from November through March, in fruit from February through April.

Among the species of *Blakea* with pendent green flowers, *B. austin-smithii* is distinguished by its saccate pouches at the petiole-laminar junction, bluntly denticulate leaf blades, and linear-lanceolate outer floral bracts that equal or exceed the calyx lobes at anthesis.

3. Blakea brunnea Gleason, in Woodson & Schery, Ann. Missouri Bot. Gard. 28: 435. 1941. TYPE: Panama. Chiriquí: vicinity of Bajo Chorro, 1900 m, 20–22 July 1940, *Woodson & Schery 618* (holotype, NY; isotype, MO).

Distribution and phenology. Endemic to the cloud forests of western Panama at 900–2300 m. Flowering collections have been made in January, March, and August, fruiting collections in July and December.

The flowers of this species, which measure 13.5 cm across when fresh, are the largest of any known member of the Melastomataceae in the Mesoamerican region. The large flowers, rupturing calyx, and mixture of stout conic and flattened hairs on floral peduncles and young vegetative organs readily distinguish this species.

4. Blakea calycosa Gleason, Phytologia 1: 342. 1939. TYPE: Panama. Coclé: vicinity of El Valle, 600–1000 m, 14 May 1939, *Allen 1788* (holotype, NY; isotypes, F, MO, US).

Distribution and phenology. Local and uncommon in cloud forests of Costa Rica and Panama at 600–1400 m. Flowering and fruiting collections have been made from August through March.

Blakea calycosa is most similar to *B. tuberculata* with which it shares several diagnostic characters such as tuberculate petals, glandular-puberulent styles, reflexed foliaceous appendages at the tip of each calyx lobe, and similar anther appendages. They share a similar indument on young vegetative buds that consists of variously roughened subulate hairs. After examining types and numerous collections of both taxa, I have concluded that these two species are closely related but distinct and worthy of continued recognition. Diagnostic character dif-

ferences include foliar shape and size (shorter and narrower in *B. calycosa*), petiole and petal length (longer in *B. tuberculata)*, free vs. laterally connate anther sacs (in *B. calycosa)*, and staminal appendage posture (deflexed in *B. calycosa* vs. upturned in *B. tuberculata*). The taxonomy of this species pair is complicated, however, by a series of some 25 anomalous collections from Costa Rica and Panama that do not fit comfortably into either taxon. A collection from the Caribbean slope of Costa Rica, for example (*de Nevers et al. 7797*, CAS), has leaf blades that are shaped like *B. calycosa* but approach *B. tuberculata* in overall size. In flower size this collection is intermediate between the two taxa, and it has the prominent ovary cone and collar of the latter. Another collection (*McPherson 7183*, CAS) from Cerro Tute, Panama, has petioles that approach *B. tuberculata* in length, leaf blades that are intermediate in size and shape, flowers that are intermediate in size, and an ovary apex that is modified into a low elevated cone surrounded by widely spaced glandular hairs reminiscent of *B. calycosa.* Field studies are needed to better evaluate the status of these enigmatic populations and to determine whether hybridization and introgression are responsible for the observed patterns of variation.

5. **Blakea chlorantha** Almeda, Rhodora 82: 609. 1980. TYPE: Costa Rica. Puntarenas: 3–3.5 km SE of Santa Elena and 2–3 km E of Monteverde on the Peñas Blancas trail, Cordillera de Tilarán, 1500–1540 m, 19 Dec. 1973, *Almeda et al. 2005* (holotype, DUKE; isotypes, CAS, CR, MO, NY, US).

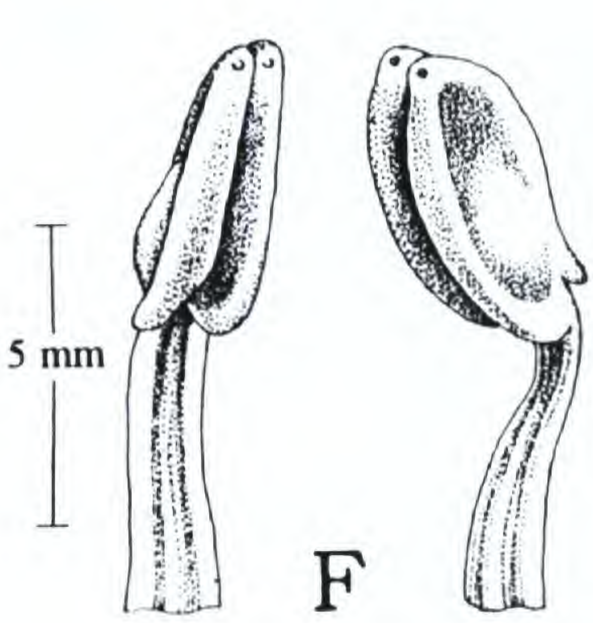
Distribution and phenology. Endemic to Costa Rica where it is confined to the Cordillera de Tilarán and adjacent areas in cloud forest, elfin woodland, and windswept ridges at 900–1800 m. Collected in flower from October through May, in fruit from January through May.

This species is readily recognized by its semicircular pseudoformicarial pouches at the petiole-laminar junction, entire leaf blades, and ovate to elliptic-ovate outer floral bracts that are conspicuously shorter than the calyx lobes at anthesis.

6. **Blakea coloradensis** Almeda, sp. nov. TYPE: Panama. Chiriquí/Bocas del Toro border: cloud forest off road to Cerro Colorado, 1450 m, 26 Jan. 1989, *Almeda et al. 6417* (holotype, CAS; isotypes, MEXU, MO, NY, PMA, US). Figure 1.

Frutex epiphyticus 2–3 m altus. Petioli 0.6–1.7 cm longi; lamina 6.4–12.5 × 3.2–5.8 cm elliptica apice acuminata basi acuta vel obtusa ad maturitatem coriacea et glabra, 5-nervata, nervis secundariis 1.5–2 mm inter se distantibus. Flores 6-meri in quoque nodo superiore 1–2, peduncularis 2–4.5 cm longis; bracteae exteriores 4–6 × 9–10 mm ovatae ad basim paulo (1.5–2 mm) coalitae; bracteae interiores 6–7 mm retusae vel subemarginatae omnino coalitae. Hypanthium (ad torum) 5–7 mm longum; calycis tubus ca. 3 mm longus, lobis 3–4 × 4–6 mm rotundatis usque truncatis. Petala 1.7–1.9 × 1.6–1.8 cm obovata apice rotundato. Antherae 4–5 × 1–1.5 mm oblongae inter se lateraliter non cohaerentes apice minute biporosae; connectivum ad basim dorsaliter paulo elevatum. Ovarium 6-loculare, cono glabro (collo non evoluto).

Epiphytic shrub 2–3 m tall. Upper branchlets glabrous and sparingly lenticellate, distinctly quadrate to sulcate becoming rounded-quadrate with age. Vegetative buds, young petioles and floral buds, and the adaxial surface and elevated primary veins of immature leaves moderately to densely covered with a brownish scurfy indument of mealy ill-defined matted particles. Mature leaves of a pair equal to somewhat unequal in size, essentially glabrous on both surfaces; petioles 0.6–1.7 cm long; blades coriaceous, 6.4–12.5 × 3.2–5.8 cm, elliptic, apex acuminate, base acute varying to obtuse, margin entire to subentire, 5-nerved, the transverse secondary veins spaced 1.5–2 mm apart at the widest portion of the blade. Flowers erect, 1 or 2 in each leaf axil of uppermost branches; peduncles 2–4.5 cm long, rounded-quadrate, glabrous and lenticellate. Floral bracts sessile, outer bracts 4–6 × 9–10 mm, fused basally for 1.5–2 mm, flaring to form a skirtlike collar, depressed-ovate, apex bluntly retuse to subemarginate, margin entire but ± undulate-involute, 3-veined, glabrous throughout; inner bracts connate for their entire length to form an unlobed cuplike collar 6–7 mm long that closely envelops the hypanthium. Hypanthium (in post anthesis) campanulate, 5–7 mm long to the torus and 8–10 mm diam., glabrous. Calyx tube ca. 3 mm long; free portions of calyx lobes 3–4 mm long and 4–6 mm wide basally, rounded-truncate, margin coarsely entire and somewhat callose-thickened at the median apex, glabrous on both surfaces. Petals 6, glabrous, 1.7–1.9 × 1.6–1.8 cm, white, obovate, apically rounded, entire. Stamens 12, isomorphic; filaments 6 mm long, complanate, glabrous and somewhat declined to one side of the flower opposing the style; anthers free, 4–5 mm long, 1–1.5 mm wide, yellow, oblong, laterally compressed with two well-separated pores at the rounded-truncate apex; connective dilated dorso-basally ca. 0.5 mm above the filament insertion into a blunt appendage. Ovary 6-celled, glabrous at the slightly elevated bluntly conic apex but lacking a collar. Style erect and somewhat incurved distally, glabrous, 1.1–1.3 cm long, the expanded stigma subtruncate to broadly



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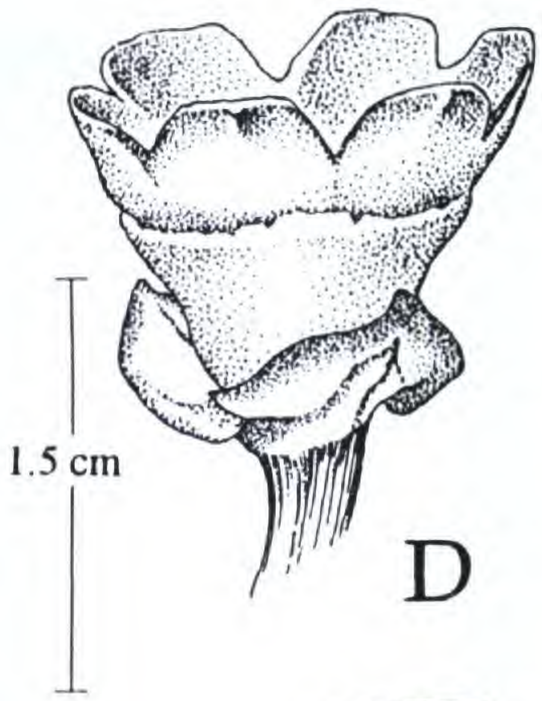

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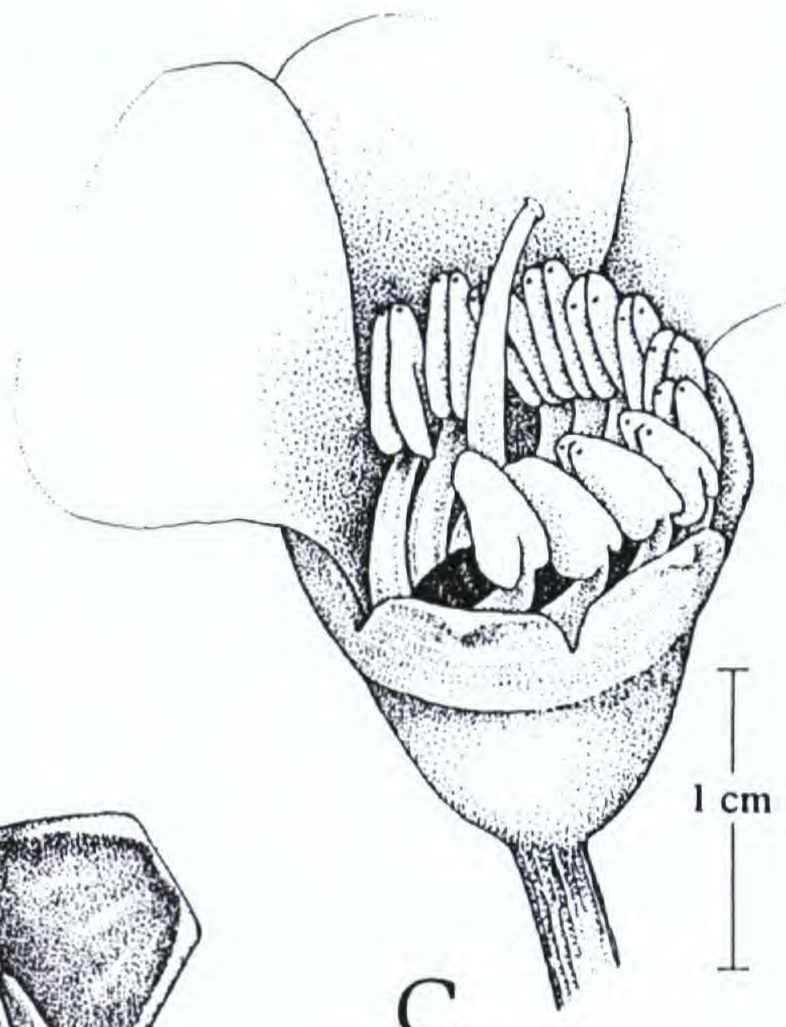

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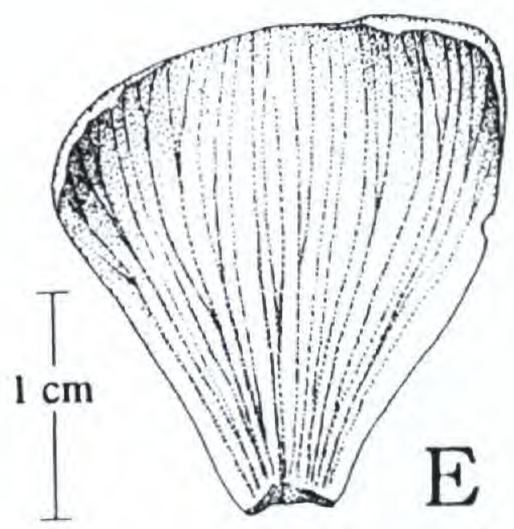

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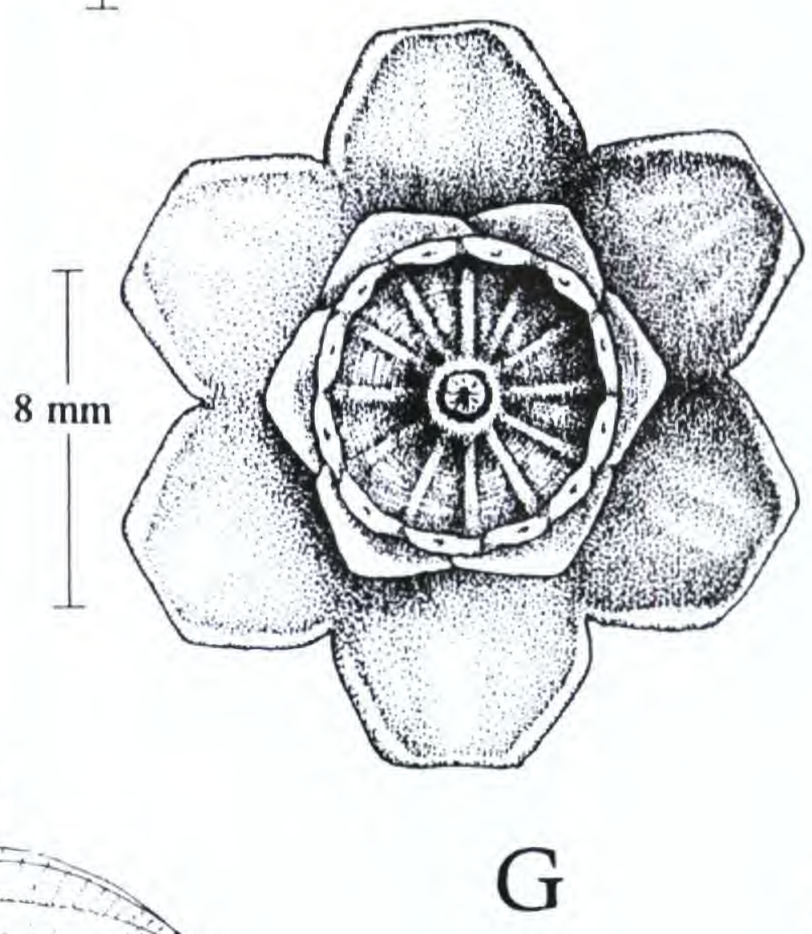

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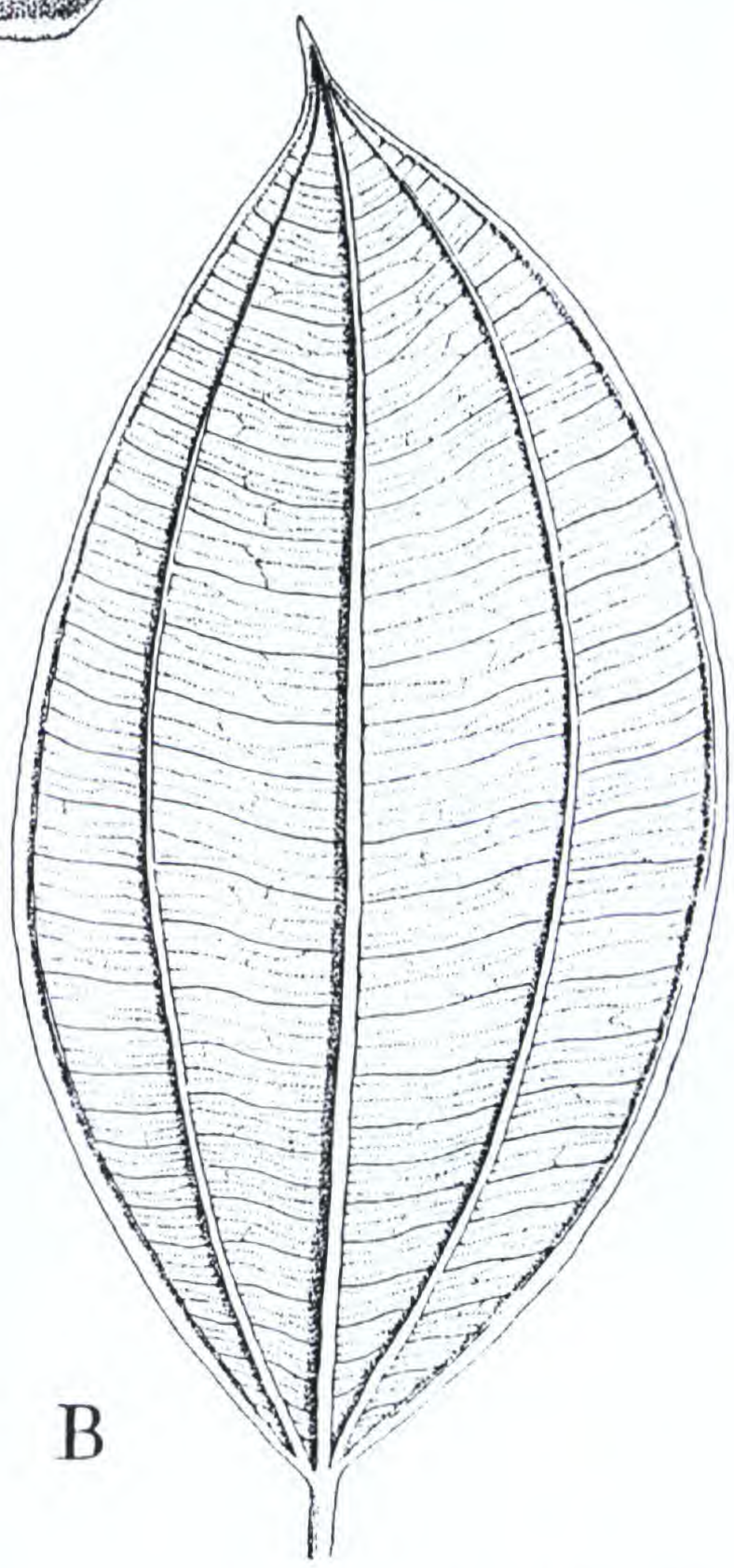

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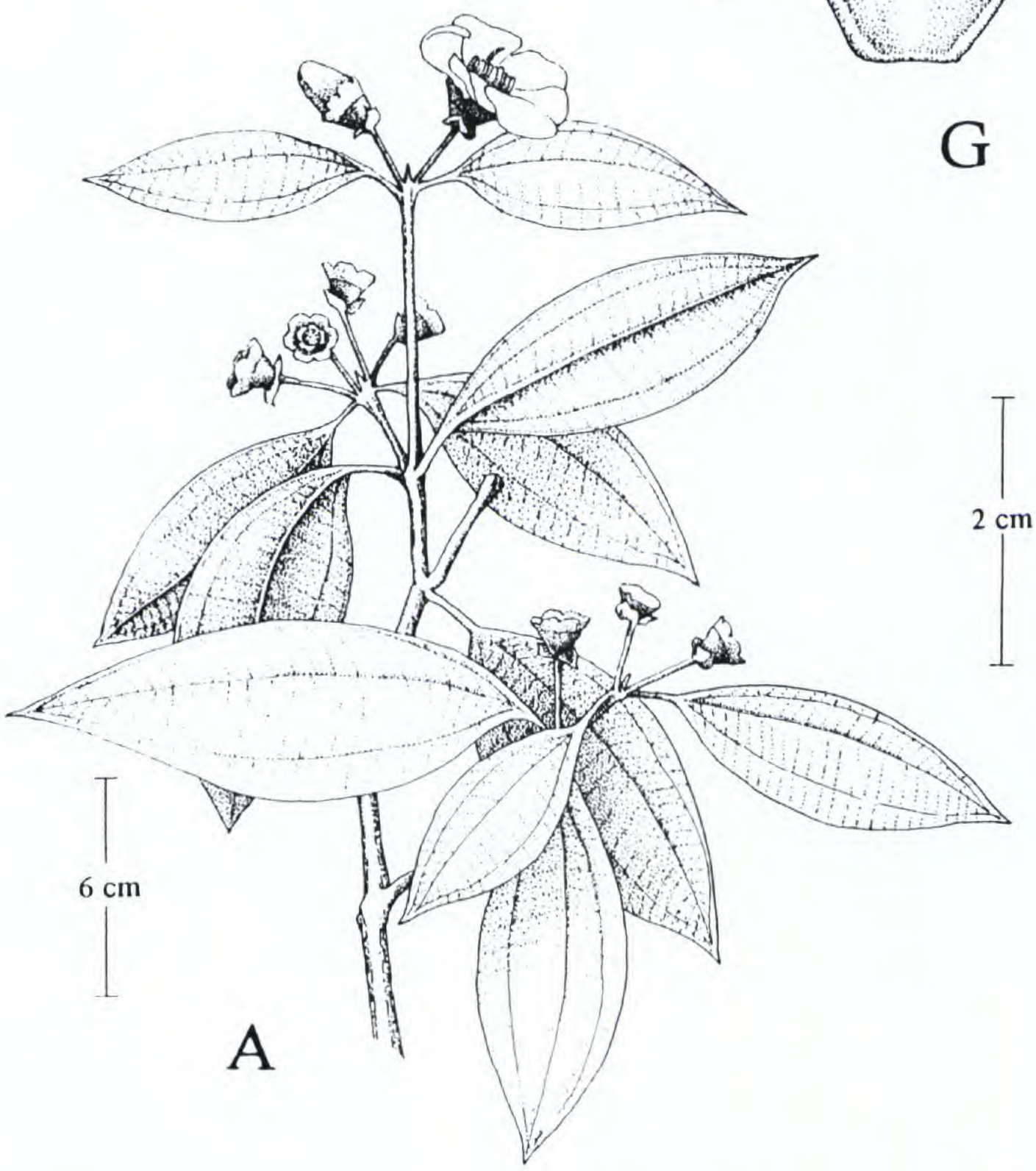


A

Figure 1. *Blakea coloradensis* Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Open flower with several petals and outer bracts removed. —D. Hypanthium and floral bracts with petals, androecium, and style removed. —E. Petal (adaxial surface). —F. Stamens, ventral view (left), lateral view (right). —G. Hypanthium (top view) showing ovary summit, torus, and calyx lobes. (A–G from *Almeda et al. 6417.*)

rounded. Berry subglobose, 1 × 1 cm. Seeds beige, mostly 1 mm long.

Distribution and phenology. A little-collected cloud forest species presently known from the Pacific slope of Cerro Colorado, Panama, at 1390–1450 m. Collected in flower in January, in fruit in July.

Blakea coloradensis is unique among its Mesoamerican congeners in having outer floral bracts that are widely spreading to form a saucer-like structure at the base of the hypanthium. The pronounced spreading posture of the outer floral bracts exposes the completely fused inner floral bracts in a way that is never seen in other members of the genus with well-developed foliaceous outer bracts. This distinctive bracteal feature coupled with the short hypanthium (5–7 mm long), comparatively narrow leaves (3.2–5.8 cm wide), and small petals (1.7–1.9 × 1.6–1.8 cm) readily sets *B. coloradensis* apart from all other members of the genus.

In having dorsally appendiculate anthers and inner floral bracts that are completely fused to form an apically truncate, cupulate collar that tightly envelops the hypanthium, *B. coloradensis* is most similar to *B. storkii* of Costa Rica and Panama. Plants of the latter species are invariably coarser with outer floral bracts that are fused for half or more of their length to form a cup that closely envelops the inner bracts and hypanthium, the hypanthium proper is longer (1.2–1.9 cm), and the petals are modally larger (2–4.2 × 1.5–2.9 cm). Since *B. coloradensis* appears to be a local endemic with a limited elevational range, it is tempting to suggest that it was derived from an allopatric relative like *B. storkii*, which occurs at mostly higher elevations (1500–2636 m) from Cerro Pate Macho in western Panama northwestward to the Cordillera Central of Costa Rica.

Paratype. PANAMA. **Chiriquí:** Cerro Colorado, along road to copper mine, 34.1 km beyond bridge over Río San Felix near town of San Felix, 13.1 km beyond turnoff to Escopeta, 15 July 1976 (fr), *Croat 37300* (MO).

7. **Blakea costaricensis** Umaña & Almeda, Selbyana 12: 1. 1991. TYPE: Costa Rica. Limón: Valle de Estrella, Fila Matama, El Progreso, 1600 m, 24 Apr. 1989, *Herrera & Chacón 2758* (holotype, CR; isotypes, CAS, COL, F, K, MEXU, MO, QCNE, US, USJ, WIS).

Distribution and phenology. This little-collected endemic of Costa Rica appears to be restricted to the Caribbean slopes of the Cordillera de Talamanca in montane forests at 1300–1600 m. Flowering collections have been made in April; fruiting collections are unknown.

Among Mesoamerican species of *Blakea*, this species is unusual in having large flowers that measure 10–11 cm across when fresh, a calyptriform calyx, and floral bracts that are 6-lobed and reminiscent of a typical calyx. *Correa & Montenegro 10169* and *McPherson 7926* (both at CAS) from Parque Nacional Altos de Campana, Panama, are reminiscent of *B. costaricensis* in having thick coriaceous leaves and a calyptriform calyx. Field observations and additional study of the Panama plants are needed to determine whether they are conspecific with *B. costaricensis*.

8. **Blakea crinita** Gleason, Phytologia 3: 356. 1950. TYPE: Panama. Coclé: crest of Cerro Pajita, *Allen 3956* (holotype, NY; isotypes, BM, MO).

Distribution and phenology. This little-collected species is known only from cloud forest habitats on Cerros Pajita and Gaital in the vicinity of El Valle de Antón, Panama, at 900–1400 m. Collected in flower from November through January, in very young fruit in February, July, and November.

In the protologue of this species, Gleason stated that he could not satisfactorily determine the structure of the hypanthium and involucre (floral bracts) because of the dense hair covering. This species was known to him only from the type. Two of the five additional collections examined for this treatment each have a single open flower and none has mature fruits, so a thorough analysis of the reproductive characters in this species is still needed. *Blakea crinita* is unusual in having a combination of essentially sessile flowers, laterally connate anthers, and a calyx that ruptures at anthesis in two to six deciduous lobes. On fruiting hypanthia, remnants of the calyx form a tubelike flange.

9. **Blakea cuatrecasii** Gleason, Bull. Torrey Bot. Club 72: 387. 1945. TYPE: Colombia. Valle: Cordillera Occidental, 900–1180 m, *Cuatrecasas 15180* (holotype, NY; isotypes, CAS, F, US).

Distribution and phenology. Localized in central and eastern Panama where it is known from cloud forests on Cerros Jefe, Mali, Sapo, and Pirre extending to western Colombia at 650–1500 m. Collected in flower and fruit sporadically throughout the year.

This species exhibits much variation in leaf shape and the size and degree of fusion of the outer floral bracts, but none of the differences can be

correlated with geography or other characters. The recognition of a single taxonomic entity seems warranted in view of interpopulational homogeneity with respect to the lepidote indument on abaxial foliar surfaces, semicircular floral bracts, bicolored petals (white with red-pink apical band abaxially), and pseudoterminal position of the anther appendages.

10. Blakea cuneata Standley, Publ. Carnegie Inst. Wash. 461: 76. 1936. TYPE: Belize. Petén: Río Viejo, Camp 32, 20 Nov. 1933, *Schipp S-604* (holotype, F).

Blakea bella Standley, Field Mus. Nat. Hist., Bot. Ser. 22: 94. 1940. Syn. nov. TYPE: Guatemala. Izabal: bank of Río Dulce, 28 Mar. 1939, *Wilson 402* (holotype, F).

Distribution and phenology. Local in rainforests from Belize to Guatemala and Honduras at 250–1140 m. Collected in flower during September and October, in fruit during April and May.

The only character used to distinguish *B. cuneata* and *B. bella* in the past has been petal length (Standley & Williams, 1963). Petal size for the former was reported as 1.5 cm long in the protologue, whereas that of the latter was given as 3 cm long. Petals on the holotype of *B. bella* are in fact only 2–2.5 cm long. All other specimens attributable to this complex have petals ranging in length from 1.5 to 2.5 cm. Because these two species are otherwise identical or exhibit comparable patterns of size variation in all other features, there appears to be no sound basis for the continued recognition of two taxa. I herein relegate *B. bella* to the synonymy of *B. cuneata.*

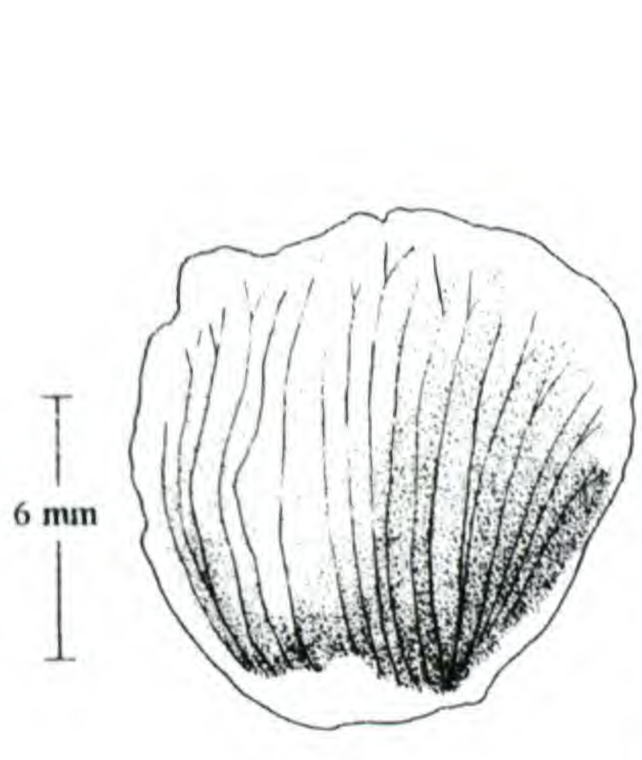
11. Blakea darcyana Almeda, sp. nov. TYPE: Panama. Chiriquí: Fortuna Dam area, N of reservoir, ridge along Continental Divide and southward from Quebrada de Arena, 1100–1500 m, Aug. 1984, *W. G. D'Arcy & C. Todzia 15958* (holotype, CAS; isotypes, MO, US). Figure 2.

Frutex. Petioli 1.1–2.1 cm longi; lamina 4.9–7.7 cm obovata apice caudata basi acuta vel acuminata ad maturitatem coriacea et glabra, 3–5-nervata, nervi in axillis acarodomatiis instructi, nervis secundariis 0.25 mm inter se distantibus. Flores 6-meri in quoque nodo superiore singuli, peduncularis 0.9–1.2 cm longis; bracteae exteriores 1.1–1.3 × 1.1–1.2 cm ovatae vel ovato-ellipticae, ad basim paulo (1 mm) coalitae vel omnino liberae; bracteae interiores 1–1.2 × 1–1.4 cm obovatae, omnino liberae. Hypanthium (ad torum) 0.6 cm longum; calycis tubus 4 mm longus, lobis paullulo 6-undulatus. Petala 12–13 × 13.5–17 mm ovata apice rotundato vel undulato. Antherae 4.5–5 × 3–3.5 mm inter se lateraliter non cohaerentes apice minute biporosae; connectivum ad basim dorsaliter dente 0.25 mm descendenti armatum. Ovarium 6-loculare, cono glabro (collo non evoluto).

Shrub. Upper branchlets terete to rounded-quadrate and glabrous with thickened interpetiolar lines or ridges. Mature leaves of a pair equal or nearly so, glabrous on both surfaces; petioles 1.1–2.1 cm long; blades coriaceous when dry, 4.9–7.7 cm long and 3–4.5 cm wide, obovate, apex caudate, base acute to acuminate, margin entire, 3- to 5-nerved with inconspicuous but well-developed, irregularly ruptured domatia formed at the abaxial blade base in the angles between the median vein and each of the two proximal lateral veins, the striolate transverse secondary veins spaced 0.25 mm apart or less at the widest portion of the blade. Flowers erect, solitary in the uppermost leaf axils and appearing pseudoterminal; peduncles 0.9–1.2 cm long, somewhat compressed laterally when dry, glabrous throughout. Floral bracts sessile, entire and glabrous throughout; outer bracts 1.1–1.3 × 1.1–1.2 cm, free or fused basally for 1 mm at anthesis, ovate to elliptic-ovate, apex bluntly short-acuminate; inner bracts 1.1–1.2 × 1–1.4 cm, free, obovate, apex rounded. Hypanthium campanulate to suburceolate, 0.6 cm long to the torus and 0.6 cm diam., glabrous. Calyx 4 mm long from the torus, flangelike and involute, the lobes merely depressed undulations with inconspicuous callose thickenings at the median abaxial apex, glabrous on both surfaces. Petals 6, glabrous, 12–13 × 13.5–17 mm, white flushed with pink, depressed-ovate to suborbicular, apically rounded to gently undulate, entire. Stamens 12, isomorphic, filaments 5–8 mm long, complanate and glabrous; anthers free, 4.5–5 mm long, 3–3.5 mm wide on the lateral face, probably yellow, ellipsoid in profile view, laterally compressed with two well-separated pores at the apex; connective thickened and dilated dorso-basally into a blunt deflexed appendage less than 0.25 mm long about 1 mm above the base of the anther thecae. Ovary 6-celled, glabrous at the elevated conelike apex. Style glabrous, 6–7 mm long; stigma punctiform. Mature berry and seeds not seen.

Distribution and phenology. Known only from the type collection made in western Panama.

Blakea darcyana is distinguished by its glabrous, apically caudate leaves, finely striolate foliar venation, foliaceous floral bracts that conceal the hypanthium, flangelike involute calyx tube, and dorso-basally appendiculate anther connective. Another distinctive, but readily overlooked, diagnostic feature of this species is the domatia (most evident when ruptured) at the abaxial blade base



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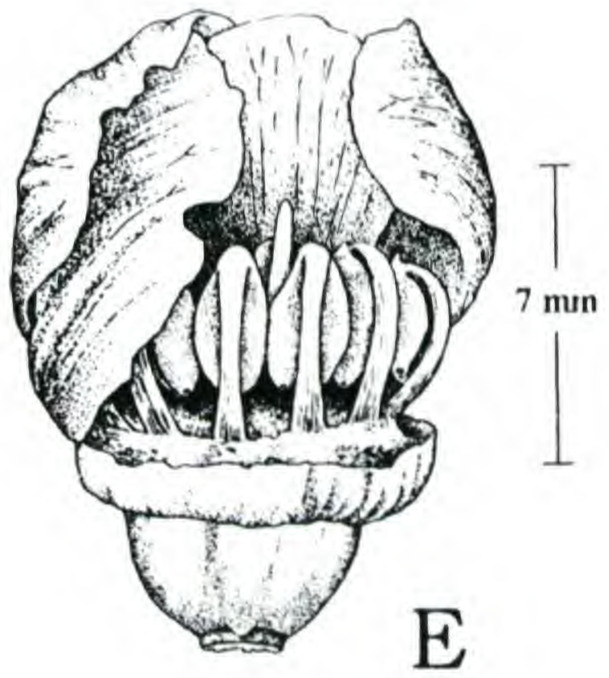

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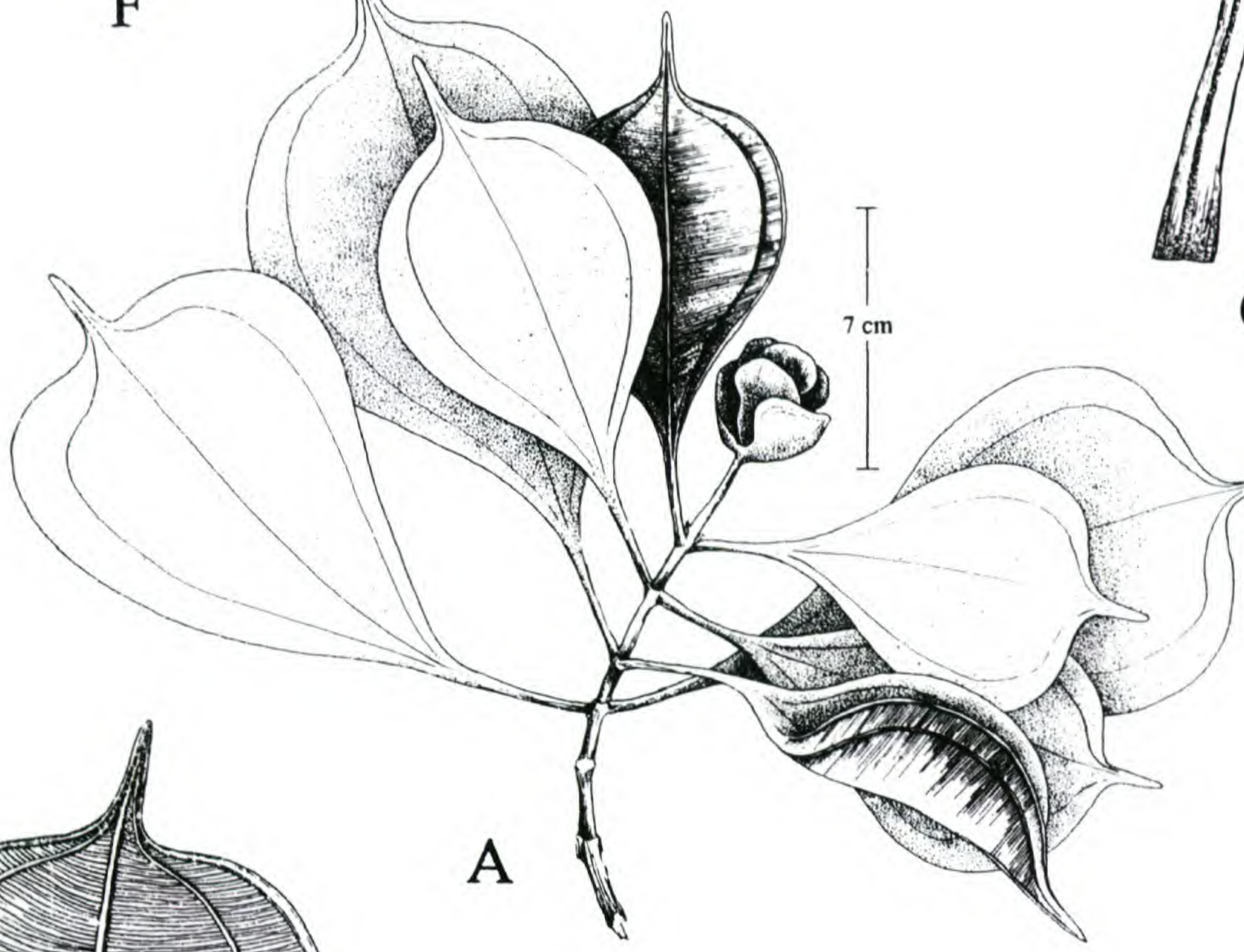

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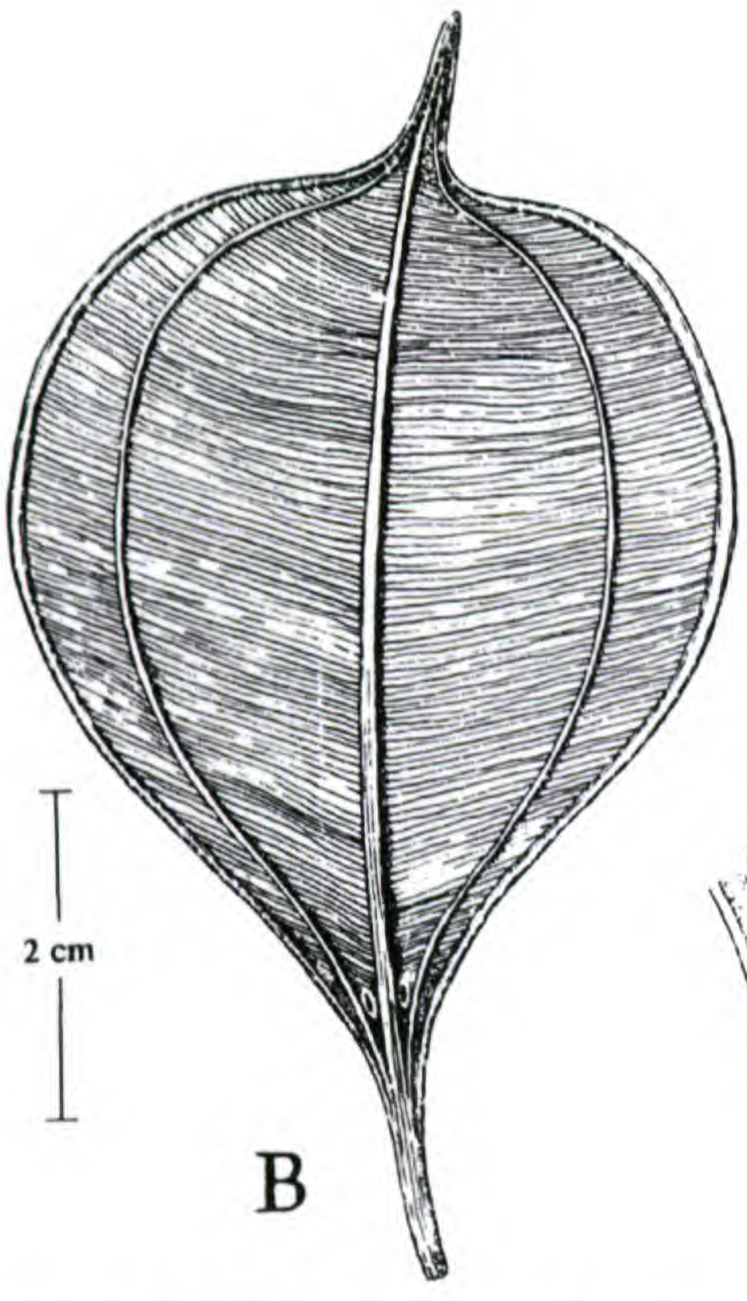

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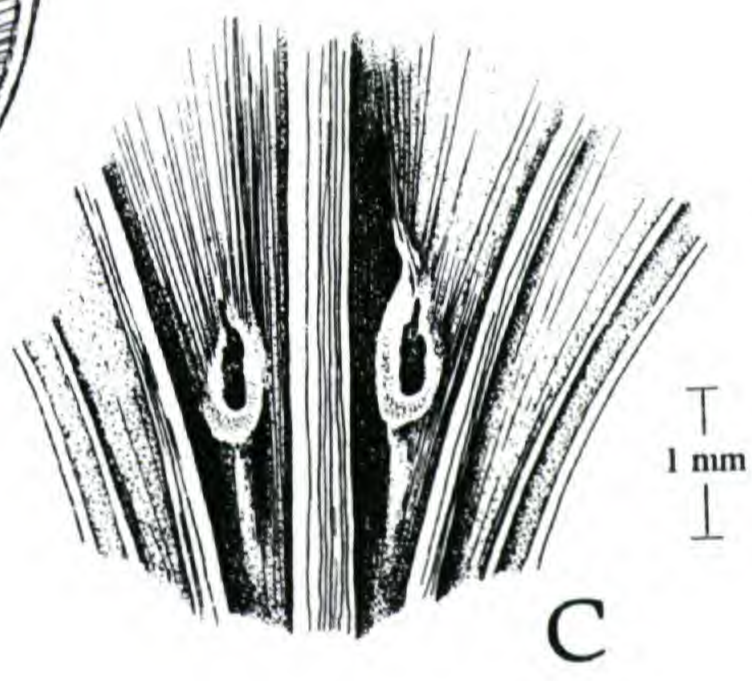

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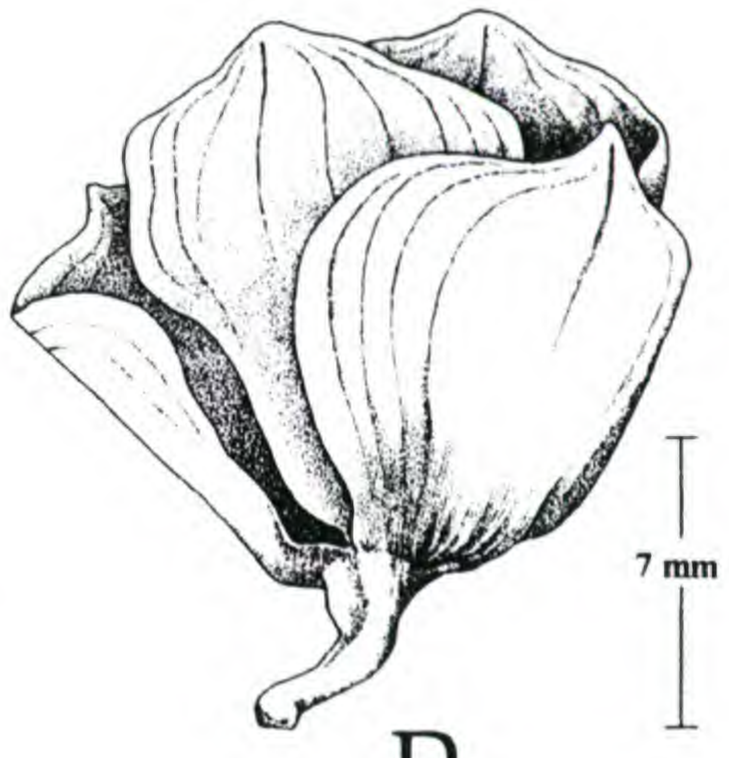

D

Figure 2. *Blakea darcyana* Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Leaf base (abaxial surface) showing perforated domatia. —D. Flower bud enveloped and concealed by outer and inner bracts. —E. Flower in pre-anthesis with three petals removed. —F. Petal (adaxial surface). —G. Stamen, lateral view. (A–G from *D'Arcy & Todzia 15958.*)

in the angles between the median vein and each of the two proximal lateral veins (Fig. 2C). Vegetatively, *B. darcyana* is reminiscent of some of the broader-leaved populations of *B. herrerae* Almeda, another Panama endemic. The latter, however, has greatly reduced floral bracts that do not conceal the hypanthia, pale greenish white petals, and laterally connate anther thecae; it lacks foliar domatia. *Blakea gracilis* is the only other species with which *B. darcyana* might be confused because of its large foliaceous floral bracts and unlobed flangelike calyx. It differs consistently from the new species in its laterally connate anther thecae, longer floral peduncles (2.1–4.2 cm), hypanthia that are costulate in post-anthesis, and lack of foliar domatia.

The label on the type describes *B. darcyana* as a shrub. More collections and additional field observations may show that it is often epiphytic like so many members of the genus that occur in the perpetually wet cloud forest covering the slopes and valleys of the Fortuna region of western Panama.

This species is named for William G. D'Arcy (1931–1999), collector of the type and long-time student of the Solanaceae and the neotropical flora, in recognition of his many contributions to understanding the rich and diverse flora of Panama.

12. Blakea elliptica (Gleason) Almeda, Proc. Calif. Acad. Sci. 43: 270. 1984. *Topobea elliptica* Gleason, Phytologia 3: 353. 1950. TYPE: Panama. Bocas del Toro: N slopes of Cerro Horqueta, 6000–7000 ft., 5–7 Aug. 1947, *Allen 5001* (holotype, MO).

Distribution and phenology. Uncommon in cloud forests, elfin forests, and windswept ridges from the Fortuna region to the vicinity of Cerro Horqueta in western Panama at 1800–2100 m. Collected in flower from January through March, September, and December, in fruit from February through May.

This is one of the most distinctive Central American species of *Blakea* because of its sessile clasping leaves and deciduous indument of spreading glandular and blunt conic hairs on distal branchlets, pedicels, floral bracts, and vegetative buds.

13. Blakea foliacea Gleason, Phytologia 3: 355. 1950. TYPE: Panama. Bocas del Toro: vicinity of Chiriquí Lagoon, 14 Apr. 1941, *von Wedel 2219* (holotype, NY; isotype, US).

Distribution and phenology. Cloud forests and rainforests in Costa Rica where it is uncommon and Panama where it is locally very common at 250–1200(–2000) m. Collected in flower and fruit throughout the year.

The diagnostic features of *B. foliacea* include the inconspicuous abaxial foliar domatia, free foliaceous floral bracts, and laterally connate anthers.

Variation in pubescence quantity and the size and shape of floral bracts is considerable in this species. None of the extremes involving either character can be correlated with other differences. The most pubescent populations occur on Cerro Colorado and in the Fortuna region of western Panama, but even these extremes are sufficiently diverse in other characters to preclude recognition of geographically meaningful taxa. Floral bract size and shape also vary independently of other characters throughout the range of this species.

14. Blakea fuchsioides Almeda, Proc. Calif. Acad. Sci. 46: 137. 1989. TYPE. Panama. Chiriquí: La Fortuna area, ca. 7 mi. N of Los Planes de Hornito, 1097 m, 26 Aug. 1983, *Hammel & Kress 13473* (holotype, CAS; isotype, DUKE).

Distribution and phenology. Endemic to cloud forests of western Panama at 1050–1650 m. Collected in flower in January, in fruit in March.

This is a striking species with showy pendent flowers that are reminiscent of *Fuchsia* in their pendent posture and two-toned coloration. Although field observations of open flowers are still lacking, I strongly suspect that this species produces floral nectar because it otherwise has all the earmarks of a hummingbird-pollinated flower (Almeda, 1989; Proctor et al., 1996).

15. Blakea gracilis Hemsley, Diag. Plant. Nov. 1: 13. 1878. TYPE: Costa Rica. *Endres 248* (holotype, K).

Distribution and phenology. Locally common in cloud forests from Nicaragua to Panama at 1200–2300 m. Collected in flower from September through April, in fruit from November through July.

This species and *B. litoralis* L. O. Williams, which are very similar vegetatively, are commonly confused. *Blakea gracilis* has bright yellow anthers, white petals with a flush of pink on the abaxial margins, and an ovary that is somewhat to markedly costulate in post anthesis. In *B. litoralis*, the anthers are pink or very pale yellow-white, the petals are pink, and the ovary (even when immature) is terete and smooth. In *B. gracilis* the anthers are rounded apically, whereas in *B. litoralis* they are bluntly obconic apically. These two species also appear to have modally different elevational distri-

butions. *Blakea litoralis* grows at lower elevations (0–1000 m) rarely extending to 1250 m, whereas *B. gracilis* prefers higher elevations (1200–2200 m).

16. Blakea grandiflora Hemsley, Diag. Plant. Nov. 1: 13. 1878. TYPE: Costa Rica. *Endres 230* (holotype, K).

Blakea pittieri Cogniaux, DC. Monogr. Phan. 7: 1080. 1891. Syn. nov. TYPE: Costa Rica, La Palma, 1550 m, *Pittier 697* (holotype, BR).

Distribution and phenology. Endemic to Costa Rica where it is locally common on cloud forest slopes of the Cordillera de Tilarán, Cordillera Central, and Cordillera de Talamanca at (950–)1500–2500 m. Collected in flower and fruit from July through January.

This species is variable in habit, foliar size, and indument abundance. In some populations all individuals are free-standing trees. In others, all plants encountered are epiphytic shrubs. In foliar size, some individuals have uniformly small leaves (8–9.5 × 3–6 cm) whereas others have much larger leaves (14–26 × 8–13.5 cm). The holotype of *B. grandiflora*, the older name for this species, constitutes the glabrous extreme, whereas the holotype of *B. pittieri* represents a population of the more pubescent variant. These variants are connected by a range of intermediates that makes assignment of all but the extremes difficult and arbitrary. Because all of the populations in this complex are very similar in vegetative and reproductive characters, the recognition of a single taxonomic entity appears to be the most prudent and defensible disposition based on available data.

17. Blakea gregii Almeda, Proc. Calif. Acad. Sci. 46: 305. 1990. TYPE: Panama. Chiriquí: Cerro Pate Macho, 2100 m, 17 Jan. 1986, *G. de Nevers & G. McPherson 6840* (holotype, CAS; isotypes, MEXU, MO, PMA, US).

Distribution and phenology. Endemic to a small area of western Panama extending from Cerro Horqueta to Cerro Pate Macho in cloud forest or elfin forest at 1800–2200 m. Collected in flower in January, in fruit in March. It is known from fewer than five collections.

Blakea gregii differs from the other four green-flowered species of *Blakea* in having uppermost internodes and elevated primary veins on abaxial leaf surfaces that are densely covered with appressed brown hairs 1–2.5 mm long, leaves that lack the saccate pseudoformicarial pouches at the petiole-laminar junction, and outer and inner floral bracts that are shorter than the combined length of the hypanthium and calyx lobes.

18. Blakea guatemalensis Donnell Smith, Bot. Gaz. 14: 25. 1889. TYPE: Guatemala. Alta Verapaz, Pansamala, 3800 ft., Sep. 1886, *von Tuerckheim 778* (holotype, US; isotypes, BR, K).

Blakea subpeltata Cogniaux, DC. Monogr. Phan. 7: 1075. 1891. Syn. nov. TYPE: Costa Rica. Turrialba, *Oersted 8* (holotype, C not seen; isotype, BR).

Distribution and phenology. Local and uncommon in Guatemala with disjunct populations in Costa Rica and Panama in rainforests and cloud forests at 50–1600(–2000) m. Collected in flower from October through April, in fruit from January through July.

The distinctive characters of *B. guatemalensis* include its pronounced foliar dimorphism at each node, subpeltate leaf blades, completely free floral bracts, and laterally connate anthers with connectives that are keeled dorsally and modified dorsobasally into a deflexed spurlike appendage.

When Cogniaux described *B. subpeltata* from Costa Rica he did not compare it with *B. guatemalensis* nor did he provide any comments on its affinities. It is difficult to know what led him to recognize the Guatemalan and Costa Rican populations as distinct taxa because they are similar in all details. The holotype of *B. guatemalensis* appears to be an extreme variant in having somewhat longer floral peduncles than all other collections seen from Guatemala or Costa Rica. Because these two taxa are otherwise indistinguishable in all vegetative and reproductive features, I consider them to be conspecific. *Carrasquilla 2049* (US) from Panama is the first and only known record from that country.

19. Blakea hammelii Almeda, Proc. Calif. Acad. Sci. 46: 309. 1990. TYPE: Panama. Chiriquí: 3.5 mi. NE of Boquete, end of road on slope S of Río Palo Alto, 17 Nov. 1978, *Hammel 5688* (holotype, CAS; isotype, MO).

Distribution and phenology. Known only from the slopes of Cerro Pate Macho and along the Río Palo Alto in western Panama where it is local and uncommon in cloud forests at 1600–1900 m. Collected in flower in January, March through April, and November, in fruit from January through April.

Vegetatively, *Blakea hammelii* resembles *B. pauciflora*, but it is readily distinguished by the following combination of characters: leaf blades that are caudate to cuspidate apically, greatly reduced floral bracts (3–5 × 2–3.5 mm), well-developed broadly ovate calyx lobes, and free anther thecae.

20. Blakea herrerae Almeda, Proc. Calif. Acad. Sci. 46: 311. 1990. TYPE: Panama. Comarca de San Blas: El Llano–Cartí road at about km 19, Ina Igar trail in the vicinity of Nusagandi, 350 m, 1 Feb. 1989, *Almeda et al. 6507* (holotype, CAS; isotypes, AAU, BM, BR, CR, DUKE, F, G, MA, MEXU, MICH, MO, NY, P, PMA, TEX, US, WIS).

Distribution and phenology. Low rainforests from the Caribbean slope of central Panama (Coclé) east to the Nusagandi region (Comarca de San Blas) at 100–400 m. Flowering and fruiting sporadically throughout the year.

Blakea herrerae has flowers that are erect at anthesis with greenish white more or less translucent petals, free floral bracts, and unappendaged laterally connate anther thecae.

21. Blakea litoralis L. O. Williams, Fieldiana, Bot. 31: 34. 1964. TYPE: Costa Rica. Puntarenas: vicinity of Esquinas Experiment Station, Golfo Dulce area, sea level, 30 Sep. 1949, *Allen 5329* (holotype, F; isotypes, F, K, US).

Blakea florida L. O. Williams, Fieldiana, Bot. 31: 33. 1964. Syn. nov. TYPE: Costa Rica. Guanacaste: 5 km E of Tilarán above Laguna de Arenal, 900–1000 m, 13 Feb. 1963, *Williams & Williams 25099* (holotype, F; isotypes, NY, US).

Blakea gracilis Hemsley var. *longifolia* Cogniaux, Bull. Soc. Roy. Bot. Belgique 30: 266. 1891. Syn. nov. TYPE: Costa Rica. Entre le General et le Río San Pedro, *Tonduz 3764* (holotype, BR).

Distribution and phenology. Essentially restricted to Costa Rica with one collection known from the El Valle region of Panama in rainforests and low cloud forests at sea level to 1000(–1250) m. Collected in flower from August through April, in fruit from February through April.

This species and *B. florida*, which were described on consecutive pages of the same publication, are identical in all vegetative and fruit characters and I consider them conspecific. I adopt the name *B. litoralis* for this species and relegate *B. florida* to synonymy because the type of the former has good flowers, whereas the type of the latter lacks petals and stamens. For diagnostic differences between *B. litoralis* and its presumed closest relative, *B. gracilis*, see the discussion following the latter species.

22. Blakea pauciflora Gleason, Phytologia 3: 357. 1950. TYPE: Panama. Chiriquí: Sierra del Boquete, *Maurice 744* (holotype, NY; isotype, US).

Distribution and phenology. Endemic to Costa Rica and Panama where it is locally common in rainforests and cloud forests at 700–1800(–2100) m. Collected in flower and fruit throughout the year.

The species is recognized with ease because the calyx tube is spreading and flangelike, and the calyx lobes are obsolete or evident as broadly depressed deltoid undulations with blunt callose-thickened teeth abaxially.

23. Blakea penduliflora Almeda, Brittonia 32: 508. 1981. TYPE: Costa Rica. Heredia: SW flanks of Volcán Barva above Sacramento in the vicinity of Laguna Barva, 2700 m, 28 July 1977, *Almeda et al. 3284* (holotype, CAS; isotype, F).

Distribution and phenology. Endemic to Costa Rica where it is local and uncommon in cloud forests of the Cordillera Central and Cordillera de Talamanca at 2400–2700 m.

Among the pendent-flowered species with green petals, *B. penduliflora* stands out by virtue of its essentially glabrous but conspicuously lenticellate floral peduncles and its glabrous apically obtuse to rounded outer floral bracts.

24. Blakea perforata Almeda, sp. nov. TYPE: Panama. Panamá: area surrounding Rancho Chorro, Cañazas mountains above Tortí Arriba, 400–700 m, 3 Dec. 1977, *J. Folsom et al. 6740* (holotype, CAS; isotype, MO). Figure 3.

Frutex epiphyticus. Ramuli paulo nodosi rotundato-quadrangulati demum teretes ad nodos perforati. Petioli 2–4 cm longi; lamina 8.3–16.5 × 4–8 cm elliptica apice acuminato vel caudato-acuminato basi acuta, 5-plinervata, nervis secundariis 1.5–2.5 mm inter se distantibus. Flores 6-meri in quoque nodo superiore 1–2, peduncularis 2–3 cm longis; bracteae exteriores 1.9–2.2 × 1.3–1.6 cm ovato-ellipticae, ad basim 1.3–1.6 cm coalitae; bracteae interiores 1.4–1.6 × 1.3–1.5 cm ca. 7–8 mm coalitae. Hypanthium (ad torum) 1 cm longum; calycis tubus 4–5 mm longus, lobis 2–3 mm longis. Petala 2.1–2.3 × 1.8–1.9 cm ovata vel obovata apice rotundato. Antherae 4–5 × 1.5–2 mm inter se lateraliter non cohaerentes apice minute biporosae; connectivum nec prolongatum nec appendiculatum. Ovarium 6-loculare, apice glabro (cono et collo non evoluto).

Epiphytic shrub. Upper branchlets rounded-quadrate and glabrous with swollen nodes often bearing small holes 1–2 mm diam. that lead to domatia presumably occupied by ants. Vegetative buds copiously covered with a caducous mixture of finely barbed coarse subulate hairs and bifid or dendritic hairs. Mature leaves of a pair equal to somewhat unequal in size, adaxially glabrous, abaxially irregularly white-puncticulate on the ac-

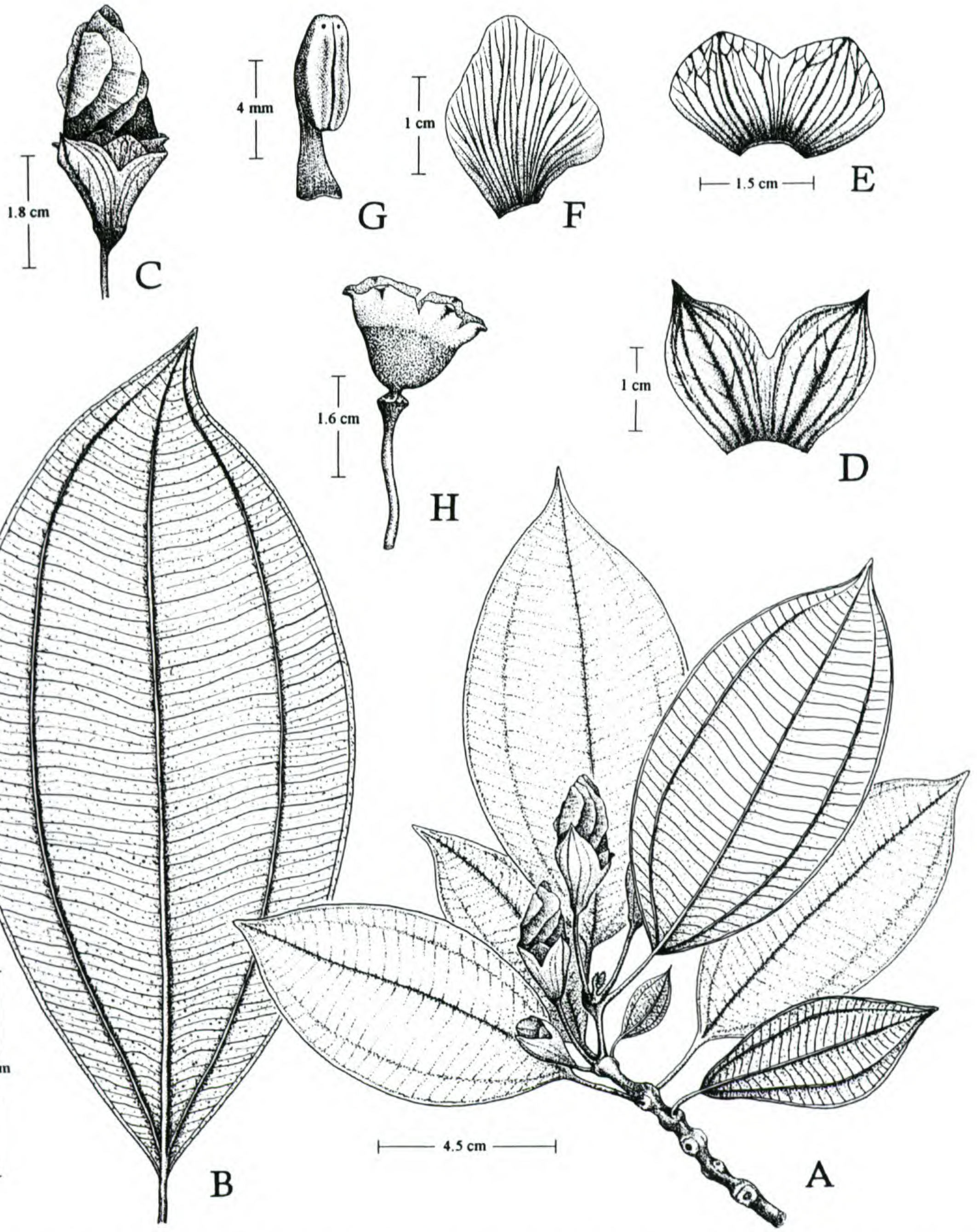

Figure 3. *Blakea perforata* Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Floral bud at pre-anthesis. —D. Outer floral bracts removed from hypanthium, cut longitudinally, and spread apart in a single plane. —E. Inner floral bracts removed from hypanthium, cut longitudinally, and spread apart in a single plane. —F. petal (adaxial surface). —G. Stamen (ventral view). —H. Hypanthium with floral bracts and all other floral parts removed. (A–H from *Folsom et al. 6740.*)

tual surface and sparingly beset with barbellate conic hairs on the elevated primary veins where they diverge from the median vein at the blade base; petioles 2–4 cm long; blades coriaceous when dry, 8.3–16.5 × 4–8 cm, elliptic, apex acuminate to caudate-acuminate, base acute, margin entire, 5-plinerved with the innermost pair of primary veins diverging from the median vein 1–6 mm above the blade base, the transverse secondary veins spaced 1.5–2.5 mm apart at the widest portion of the blade.

Flowers erect, 1 or 2 in each leaf axil of uppermost branches; peduncles 2–3 cm long, essentially terete but sulcate-striate when dry, glabrous and sparingly lenticellate distally. Floral bracts sessile and entire; outer bracts 1.9–2.2 × 1.3–1.6 cm, fused basally for 1.3–1.6 cm at anthesis, elliptic-ovate, acuminate, margin entire, 3- to 5-veined, glabrous throughout; inner bracts 1.4–1.6 × 1.3–1.5 cm, connate basally for 7–8 mm to form a 2-lobed cup-like collar that envelops the hypanthium but is somewhat concealed by the outer bracts, the free portions of the inner bracts rounded-triangular and glabrous, 0.8 × 1.5 cm. Hypanthium (in mature bud) campanulate, 1 cm long to the torus and 1–1.2 cm diam., glabrous. Calyx tube 4–5 mm long; calyx lobes 2–3 mm long and 4–5 mm wide basally, rounded with a callose thickening at the median apex on the abaxial surface, margin essentially entire, glabrous on both surfaces. Petals 6, glabrous, 2.1–2.3 × 1.8–1.9 cm, white, ovate to obovate, apically rounded, entire. Stamens 12, isomorphic; filaments 3.5–4.5 mm long, complanate and glabrous; anthers free, 4–5 mm long, 1.5–2 mm wide, yellow, oblong, laterally compressed with two well-separated pores at the truncate apex; connective somewhat thickened but not dilated into an appendage. Ovary 6-celled, glabrous at the somewhat elevated apex but lacking a collar. Style glabrous, 14.5–17 mm long in mature bud; stigma truncate. Mature berry and seeds not seen.

Distribution and phenology. Known only from the type collection.

The outstanding feature of *B. perforata* is the swollen perforated nodes of distal branches that appear to function as ant domatia. This adaptation is unknown among other Mesoamerican species of *Blakea*. What appear to be functionally similar structures among the Melastomataceae are produced in a few South American species of *Miconia*, a few species of the closely related genus *Topobea*, an as yet unpublished new genus of the tribe Miconieae (Schnell, 1996), and in the Old World genus *Pachycentria* (Maxwell, 1978).

Blakea perforata is most similar to *B. tapantiana* Umaña & Almeda and *B. cuneata* Standley in foliar and floral morphology. The former differs in having shorter floral peduncles (0.6–1 cm), narrower outer floral bracts (0.8–1.1 cm) that are fused basally for only 3–6 mm (vs. 13–16 mm in *B. perforata*), and uppermost nodes with tufts of coarse hairs that fall away to leave a distinct interpetiolar ridge or line. *Blakea cuneata*, a species of northern Central America, differs in having shorter floral peduncles (0.4–1.2 cm), larger calyx lobes (4–8 × 6–9 mm), pink petals, outer floral bracts that are fused basally for only 0.7–1 cm, and leaf blades that are glabrous to sparsely stellulate-furfuraceous abaxially where the primary veins diverge from one another at the base.

25. Blakea purpusii Brandegee, Univ. Calif. Publ. Bot. 6: 58. 1914. TYPE: Mexico. Chiapas: Cerro del Boqueron, *Purpus 6786* (holotype, UC; isotypes, BM, F, MO, NY, US).

Distribution and phenology. Endemic to Volcán Tacaná on the Chiapas, Mexico-Guatemala border and Volcán Tajumulco and environs in western Guatemala in cloud forests at 1300–2700 m. Collected in flower from October through December and in August, in fruit in March.

Blakea purpusii is most similar to a group of four southern Central American species that includes *B. austin-smithii* Standley, *B. chlorantha* Almeda, *B. gregii* Almeda, and *B. penduliflora* Almeda. All five members of this species group produce copious nectar and have pendent flowers with imbricate, pale green petals that are bell-like at anthesis. The southern Central American species have dark purple anthers and a similar purple flush at the base of each petal and anther filament. Field studies by Lumer (1981) and Lumer and Schoer (1986) have shown that *B. austin-smithii*, *B. chlorantha*, and *B. penduliflora* are visited and pollinated by six species of rodents belonging to four genera.

Blakea purpusii is geographically isolated from the other green-flowered members of the genus and also differs in having bright yellow anthers, red filaments, and green petals flushed with bright red basally. On 23–24 November 1980 I studied this species in the field on the southeastern slopes of Volcán Tacaná in Chiapas, Mexico. Copious nectar was noted in numerous flowers at 3:00 p.m. on the afternoon of the first day and many flowers in the same population also had copious amounts of nectar the following morning at 8:00 a.m. During both days the white-eared hummingbird (*Hylocharis leucotis*) was observed visiting numerous individuals of this species, taking nectar, and evidently pollinating the flowers. To my knowledge, no other observations have ever been made on possible pollinators of this species.

26. Blakea repens (Ruiz & Pavón) D. Don, Mem. Wern. Soc. 4: 325. 1823. *Valdesia repens* Ruiz & Pavón, Syst. 121. 1798. TYPE: Peru. Huánuco: Chinchao, *Ruiz & Pavón s.n.* in 1795 (holotype, MA; isotype, BM ex herb. Lambert).

Blakea incerta J. F. Macbride, Field Mus. Publ. Bot. 4: 179. 1929. TYPE: Peru. Huánaco: Cushi, 5000 ft., 19–23 June 1923, *Macbride 4850* (holotype, F).

Distribution and phenology. In the area under study this species is known from two collections made in the Fortuna region of Panama where it occurs in cloud forests at 1150–1400 m. It ranges southward to Colombia, Ecuador, and Peru. Collected in flower in February and April.

The South American populations of this species generally have larger leaves (14–21 × 6–12 cm), but they are otherwise a good match for Panamanian material in salient features such as nodal stipuliform flaps, free floral bracts, laterally connate anther sacs, glandular-puberulent styles, and the distinctive staminal appendages.

27. Blakea scarlatina Almeda, Proc. Calif. Acad. Sci. 46: 314. 1990. TYPE: Costa Rica. Alajuela: 20–30 km SE of Cataratas de San Ramón, 2150–2500 ft. (655–762 m), 20 Mar. 1978, *Almeda et al. 4308* (holotype, CAS).

Distribution and phenology. Local and uncommon mostly in the Caribbean lowlands and adjoining slopes of Nicaragua and Costa Rica in rainforest and cloud forest at 0–1450 m.

In the past some collections of this species have been erroneously identified as *B. cuneata* Standley and *B. grandiflora* Hemsley. *Blakea scarlatina* differs from both of these species in having broader floral bracts, larger flowers with brilliant red petals, and very different, prominently spurred anther connectives.

28. Blakea storkii (Standley) Almeda, comb. nov. Basionym: *Topobea storkii* Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 844. 1938. TYPE: Costa Rica. Cartago/San José border: La Chonta, near Santa María de Dota, 27 May 1928, *Stork 2308* (holotype, F).

Blakea woodsonii Gleason, in Woodson & Schery, Ann. Missouri Bot. Gard. 26: 296. 1939. Syn. nov. TYPE: Panama. Chiriquí: vicinity of Casita Alta, Volcán de Chiriquí, ca. 1500–2000 m, 28 June–2 July 1938, *Woodson et al. 951* (holotype, NY; isotypes, MO, NY, US).

Topobea grandiflora Suessenguth, Bot. Jahrb. Syst. 72: 278. 1942. Syn. nov. TYPE: Costa Rica. Chirripó Grande, elev. 2000 m, 30 Apr. 1932, *Kupper 1206* (holotype, M, MO photo, P photo, US photo).

Free-standing tree 4–10 m tall or coarse epiphytic shrub 1.5–6 m tall often overtaking crown of host tree. Upper branchlets essentially glabrous, somewhat compressed-rounded becoming rounded-quadrate with age. Vegetative buds moderately to densely covered with deciduous subulate, minutely barbellate hairs intermixed with or replaced by a scurfy paleaceous indument of scalelike exfoliations on very young leaves and petioles. Mature leaves of a pair essentially equal in size, typically glabrous on both surfaces, rarely with a very sparse scattering of subulate scurfy hairs tardily persisting on the elevated primary veins abaxially; petioles 0.9–4 cm long; blades coriaceous, 5.4–15.5 × 3.5–10.7 cm, elliptic to obovate, apex gradually to abruptly acuminate, base acute to obtuse, margin entire, 5-nerved or 5-plinerved with the innermost pair of primaries diverging from the median vein 0.5–0.7 cm above the blade base, the transverse secondary veins spaced 1–3 mm apart at the widest portion of the blade, but these are typically not prominently elevated. Flowers erect, solitary or paired in each leaf axil of uppermost branches; peduncles 0.7–5 cm long, rounded to rounded-quadrate, glabrous or sparingly scurfy-puberulent, often sparingly lenticellate distally. Floral bracts entire; outer bracts 0.9–1.8 × 0.9–1.8 cm, fused for 0.9–1.5 cm to form a cupulate collar that tightly envelops the inner bracts and hypanthium, the shallow lobes broadly depressed-triangular to very broadly rounded, margin entire or with a few coarse subulate hairs restricted to the apex of each lobe, venation typically obscure or only the median vein evident on drying, glabrous but commonly lenticellate basally at the confluence with the pedicel; inner bracts 1.2–1.8 cm long, connate for essentially their entire length to form a cupulate collar that envelops the hypanthium and is concealed in large part by the outer bracts. Hypanthium (at anthesis) campanulate, 1.2–1.9 cm long to the torus and 1.3–1.8 cm diam., glabrous. Calyx tube (in post anthesis and in fruit) 6–8 mm long; free portions of calyx lobes 4–8 mm long and 5–9 mm wide basally, truncate to rounded-truncate, margin entire and somewhat callose-thickened, glabrous on both surfaces at maturity. Petals 6, glabrous, 2–4.2 × 1.5–2.9 cm, white, the exposed abaxial apices sometimes marked with patches of reddish pink in bud, obovate, apically rounded to somewhat obtuse, entire. Stamens 12, isomorphic; filaments 7–12 mm long, glabrous and declined to one side of the flower opposing the style; anthers 4–7 mm long, 2–3 mm wide, yellow, oblong to ovate-oblong in profile view, laterally compressed with the two separated pores positioned at the apex of the truncate summit; connective thickened dorsally and prolonged dorso-basally about 1.5 mm above the anther base into a blunt appendage 0.25–1 mm long. Ovary 6-celled, glabrous at the apex, which is elevated into a cone 2–3 mm long that becomes a low dome-like emi-

nence in fruit. Style declinate, glabrous, 1.9–2.3 cm long; the stigma subtruncate to punctiform. Mature berry red-maroon, ca. 1.5 × 1.5 cm. Seeds beige, mostly 1.5–2 mm long.

Distribution and phenology. A locally common species of wet montane forests from Volcán Turrialba and Altos Tablazo in central Costa Rica southeast through the Cordillera de Talamanca to Cerro Horqueta and Cerro Pate Macho in western Panama at (1100–)1500–2636 m. Flowering and fruiting specimens have been collected throughout the year.

A study of the type specimens of *Topobea storkii*, *Blakea woodsonii*, and *Topobea grandiflora* has revealed that these three named taxa are identical in all details. They represent a single taxonomic entity characterized by inner floral bracts that are unlobed apically and connate for their entire length, outer bracts that are also fused for nearly their entire length to form a tightly enveloping cupulate collar with shallow depressed lobes, and anther connectives that are dilated dorso-basally into a blunt appendage up to 1 mm long. The anthers of this species, which are oblong to ovate-oblong, laterally compressed, blunt at the apex, and with two well-separated apical pores, dictate placement in the genus *Blakea*. The necessary generic transfer is made here since the oldest available epithet for this species was published in *Topobea*. Most of the collections of this species in herbaria have been identified as *Blakea woodsonii*. For comparisons with allied species such as *B. grandiflora* and *B. wilsoniorum*, see the discussion under the latter species.

Most populations of *B. storkii* are uniform morphologically despite their diversity in habit and comparatively broad geographic and elevational distribution. Several collections from the Fortuna and Cerro Colorado regions of western Panama are reminiscent of *B. storkii*, but they are divergent in several characters. Plants from these areas have inner and outer floral bracts that are shorter than the mature calyx lobes. The inner bracts of these collections are fused to form an apically truncate cupulate collar like that found in *B. storkii*. The outer bracts differ from typical *B. storkii* in being fused for half or more of their length with free portions that are ovate and apically acute. Only one of the collections attributable to this problem complex has flowers (*Croat 67774*, CAS). It has anther connectives that lack the dorso-basal appendage that is invariably present in *B. storkii*. In view of these differences and the fact that most of the available collections are fruiting, it seems premature to suggest that it is merely a regional variant. Its taxonomic disposition must await collection and study of more flowering material. Until then, these unusual collections have been provisionally annotated as *Blakea* aff. *storkii* to reflect their apparent affinity.

Representative specimens examined. COSTA RICA. **Cartago:** 8 km N of Trinidad on S-facing slope of Volcán Turrialba, 4 July 1977 (fl), *Almeda et al. 2884* (CAS, CR); 1 km N of Trinidad (middle elev. slope on Volcán Turrialba), 14 Feb. 1969, *Davidse & Pohl 1451* (US); in pastures on slopes of Volcán Turrialba, 6.5 km up road from Trinidad, 16 Aug. 1965, *Lent 723* (MO); Reserva Forestal Río Macho, Cordillera de Talamanca, La Chonta, 10 Apr. 1994 (fl), *Morales et al. 2670* (CAS, INB, MO); 2–3 mi. NW of Pastora, 26 June 1972 (fl), *Primack & Luteyn 209* (CAS, DUKE); ca. 2 km NE of El Empalme along dirt road, 22 Feb. 1978 (fr), *Utley 5811A* (DUKE); 6 km below Finca Central on Volcán Turrialba, 4 July 1977 (fl), *Wilbur 21919* (DUKE). **Cartago/San José:** along Interamerican Hwy., 0.8 mi. beyond La Trinidad, Cordillera de Talamanca, 21 May 1972 (fl), *Luteyn 2966* (DUKE); ca. 1 km S of El Empalme, 4 July 1976 (fl), *Wilbur 19881* (DUKE); ca. 1.5 km SE of La Trinidad or 14.3 km SE of El Empalme, 12 July 1977, *Wilbur et al. 22580* (DUKE). **Puntarenas:** Zona Protectora Las Tablas on trail from Biological Station above Finca Las Alturas to Cerro Echandí on S flanks of Cerros Burú, 20 Feb. 1991 (fr), *Almeda et al. 6756* (CAS, CR); Cordillera de Talamanca, area around Río Canasta, 9.5 airline km NW of Agua Caliente, between Cerro Frantzius and Cerro Pittier, 6 Sep. 1984 (fl), *Davidse et al. 28467* (CAS, MO). **San José:** 2–6 km S of Higuito on lower slopes of Alto Tablazo, 20 Feb. 1978 (fr), *Almeda & Nakai 3749* (CAS, CR). **San José:** Cantón de Pérez Zeledón, P. N. Chirripó, Cuenca Térraba-Sierpe, sendero a Cerro Chirripó, 9°27′24″N, 83°32′47″W, 4 May 1997 (fl), *Gamboa & Alfaro 1338* (INB); Cantón de Coto Brus Las Mellizas, siguiendo linea divisoria entre CR y Pan., entre Cerro Nubes y Cerro Pando, 8°55′18″N, 82°43′30″W, 15 Aug. 1989 (fl), *Herrera 3415* (INB). **San José/Cartago border:** 0.8 mi. beyond La Trinidad off of the Interamerican Hwy., 21 May 1972 (fl), *Luteyn 2966* (CAS, CR, DUKE); Cordillera de Talamanca, 14.3 km SSE of El Empalme, 12 July 1977 (fl), *Almeda et al. 3046* (CAS, CR). **San José:** E edge of Cerro Tablazo and ca. 5 km by winding rd. W of Tablón, 16 July 1981 (fl), *Wilbur et al. 31487* (DUKE). PANAMA. **Bocas del Toro:** Cordillera de Talamanca, headwaters of the Río Culubre, 6 airline km NW of the peak of Cerro Echandí, 2–3 Mar. 1984 (fr), *Davidse et al. 25256* (CAS, MO); trail from near Boquete to Cerro Pate Macho, forest slopes along divide and below, 7 Feb. 1986 (fl), *McPherson & Merello 8308* (CAS, MO). **Chiriquí:** límite del Parque Internacional La Amistad, frente a la Población de Guadalupe, 21 Mar. 1990 (fr), *Aranda et al. 1213* (CAS, PMA); vicinity of Volcán Barú, near shore at Lago del Volcán, 9 June 1986 (fl), *McPherson 9463* (CAS, MO); 6 mi. above Cerro Punta on the Boquete trail, 1 Mar. 74 (fr), *Tyson 7085* (DUKE); slopes approaching Cerro Horqueta about 6.6 km NNE of Boquete, 5 Jan. 1975 (fl & fr), *Wilbur & Luteyn 19312* (CAS, DUKE).

29. Blakea subconnata Berg ex Triana var. **obtusa** Gleason, Bull. Torrey Bot. Club 72: 388. 1945. TYPE: Colombia. Valle: W slope of the Cordillera Occidental, 1400 m, *Cuatrecasas 15644* (holotype, NY).

Distribution and phenology. In the area under study known only from north-central Panama (Comarca de San Blas) in rainforests at 30–200 m ranging south to Colombia. Collected in flower from October through December, in immature fruit in December.

The floral bracts on the four known Panamanian collections of this variety are smaller than typical material from Colombia, but they are otherwise identical in their complete glabrosity, quadrate upper branchlets with carinate angles, basally vaginate petioles, and laterally connate anther thecae. The taxonomic status of this variety will need reassessment as more collections come to light.

30. Blakea tapantiana Umaña & Almeda, Novon 5: 1. 1995. TYPE: Costa Rica. Cartago: Parque Nacional Tapantí, Sendero Oropéndola, 1200 m, 3 Sep. 1992, *Umaña et al. 497* (holotype, CR; isotypes, CAS, COL, F, K, MEXU, MO, US, USJ, WIS).

Distribution and phenology. Endemic to Costa Rica where it is largely restricted to cloud forests of Tapantí National Park and adjacent areas at 1150–1450 m. Collected in flower from August through September, in fruit from March through April.

This little-collected species is distinguished by its short floral peduncles (0.6–1 cm), completely white narrowly obovate petals, and interpetiolar tufts of coarse hairs on uppermost branchlet nodes that fall away with age to leave a distinct interpetiolar line or ridge.

31. Blakea tuberculata Donnell Smith, Bot. Gaz. 31: 111. 1901. TYPE: Costa Rica. San José: La Palma, 1550 m, 15 Aug. 1898, *Tonduz 7363* (holotype, US; isotypes, CR, F, K, NY).

Distribution and phenology. Locally common in cloud forests at 700–1750 m in Costa Rica and Panama. Flowering and fruiting all year.

For notes on the relationships and variation of this species, see the discussion following *B. calycosa.*

32. Blakea wilburiana Almeda, Brittonia 26: 394. 1974. TYPE: Panama. Coclé: near La Mesa about 5 mi. N of El Valle, 22 May 1970, *Wilbur & Luteyn 11734* (holotype, DUKE; isotypes, CAS, CR, DS, F, G, GH, K, MEXU, MICH, MO, NY, PMA, TEX, UC, US).

Distribution and phenology. Local and uncommon in cloud forests from the El Copé (Coclé) region of central Panama east to Nusagandi (Comarca de San Blas) with one known outlying population in Chiriquí Province at 250–1000 m. Collected in flower sporadically throughout the year, in fruit during February, April, July, and October.

33. Blakea wilsoniorum Almeda, sp. nov. TYPE: Costa Rica. Puntarenas: along main San Vito–Ciudad Neily road, ca. 0.8 km S of turnoff to Valle Azul, 8°46′N, 82°57′W, elev. ca. 1130 m, 13 Sep. 1985, *M. Grayum et al. 6023* (holotype, CAS; isotypes, CR, MO, US). Figure 4.

Frutex epiphyticus vel arbor ad 5–8 m alta. Petioli 1–1.8 cm longi; lamina 10.5–19.5 × 5.3–9 cm, elliptica vel elliptico-obovata apice acuminata basi acuta, 5-plinervata ad maturitatem coriacea et glabra, nervis secundariis 2–4 mm inter se distantibus. Flores 6-meri in quoque nodo superiore 1–2, pedunculares 1–1.8 cm longis; bracteae exteriores 2–2.6 × 2.2–2.7 cm ovatae vel suborbiculares ca. 1.3–1.7 cm coalitae apice rotundato; bracteae interiores 1.5–1.9 cm omnino coalitae. Hypanthium (ad torum) 1.2–1.5 cm longum; calycis tubus 4–5 mm longus, lobis 3–4 × 7–10 mm rotundatis usque truncatis. Petala 2–3 × 2–3 cm obovata apice rotundato vel truncato. Antherae 6 × 3 mm oblongae inter se lateraliter non cohaerentes apice minute biporosae; connectivum ad basim dorsaliter nec prolongatum nec appendiculatum. Ovarium 6-loculare, cono 2–2.5 mm alto glabro (collo non evoluto).

Free-standing tree 5–8 m tall or epiphytic shrub 2–4 m tall. Upper branchlets glabrous, distinctly quadrate to sulcate becoming rounded-quadrate with age. Vegetative buds and very young peduncles moderately to densely covered with a deciduous indument of subulate, barbellate or dendritic hairs that vary toward and are intermixed with scurfy paleaceous hairs that have irregular lacerate margins. Mature leaves of a pair essentially equal in size, glabrous on both surfaces; petioles 1–1.8 cm long; blades coriaceous, 10.5–19.5 × 5.3–9 cm, elliptic to elliptic-obovate, apex acuminate, base acute, margin entire, 5-plinerved with the innermost pair of primaries diverging from the median vein 0.6–1.2 cm above the blade base, the transverse secondary veins spaced 2–4 mm apart at the widest portion of the blade but these are not prominently elevated. Flowers erect, solitary or paired in each leaf axil of uppermost branches; peduncles 1–1.8 cm long, somewhat compressed and 2-edged, glabrous but lenticellate distally. Floral bracts sessile, entire; outer bracts 2–2.6 × 2.2–2.7 cm, fused basally for 1.3–1.7 cm to form a collar that tightly envelops the inner bracts and hypanthium, the two lobes broadly ovate, to semicircular, sometimes varying to broadly deltoid, apex obtuse to broadly

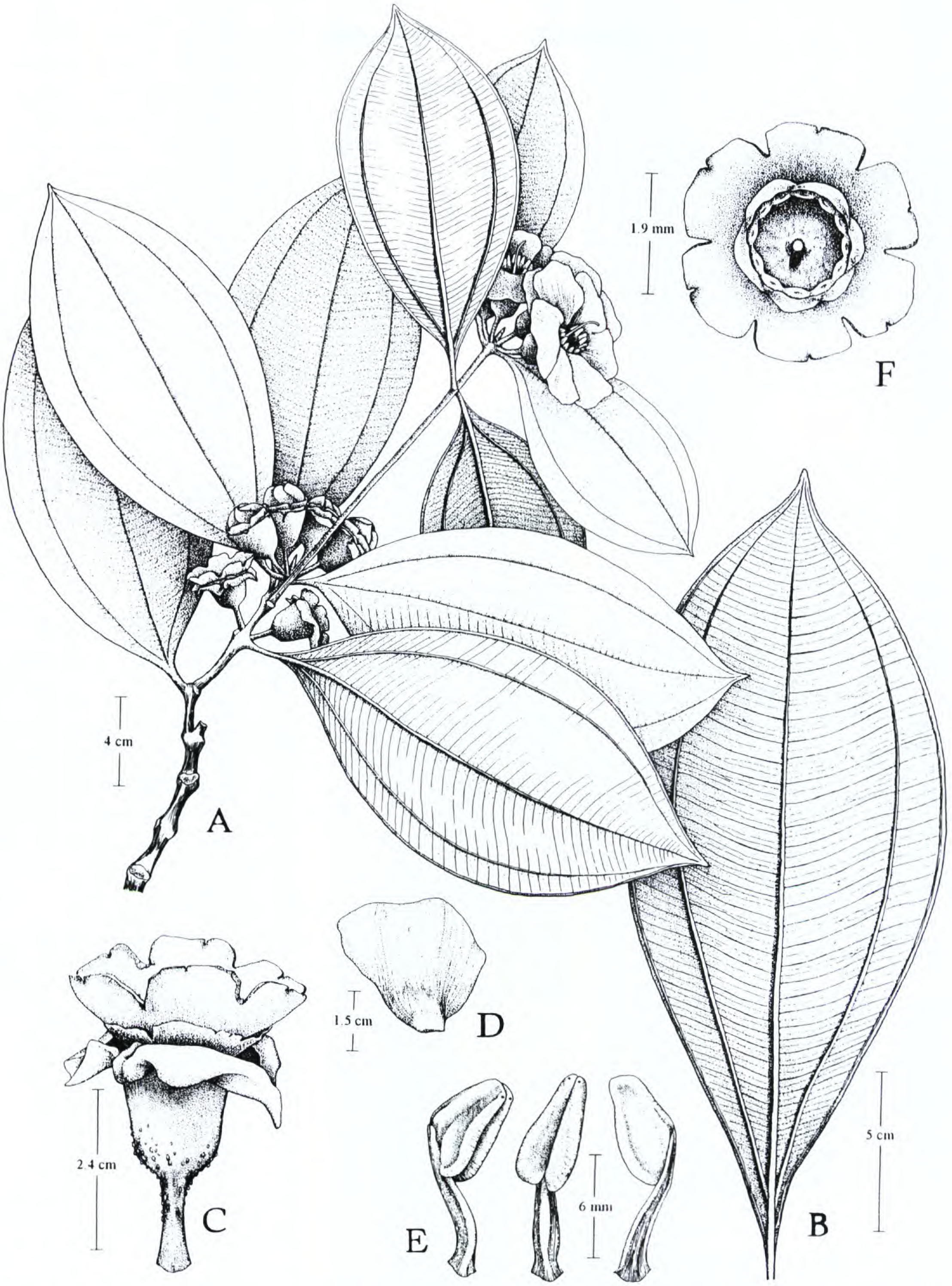

Figure 4. *Blakea wilsoniorum* Almeda. —A. Habit. —B. Representative leaf (abaxial surface). —C. Flower with petals, androecium, and style removed. —D. Petal (adaxial surface). —E. Stamens, 3/4 view (left), ventral view (middle), lateral view (right). —F. Hypanthium (top view) showing ovary summit, torus and calyx lobes. (A from *Almeda et al. 4292* and *Grayum et al. 6023*; B from *Croat 26546*; C & E from *Almeda et al. 4292*; D & F from *Grayum et al. 6023*.)

rounded, margin entire but undulate-involute, only the median vein typically evident on drying, glabrous or moderately to sparingly covered with an indument like that of vegetative buds, lenticellate basally at the confluence with the pedicel; inner bracts 1.5–1.9 cm long, connate for their entire length to form an apically flaring collar that tightly envelops the hypanthium but is typically concealed in large part by the outer bracts. Hypanthium (at anthesis and in young fruit) campanulate to cupulate, 1.2–1.5 cm long to the torus and 1–1.7 cm diam., glabrous. Calyx tube 4–5 mm long; free portions of calyx lobes 3–4 mm long and 7–10 mm wide basally, rounded-truncate, margin essentially entire and callose-thickened, glabrous on both surfaces. Petals 6, glabrous, 2–3 × 2–3 cm, reportedly pink or white flushed with red, obovate, apically rounded (sometimes obliquely so), truncate or retuse, entire. Stamens 12, isomorphic; filaments 8–8.5 mm long, complanate, glabrous and declined to one side of the flower opposing the style; anthers 6 mm long, 3 mm wide, free, yellow, oblong, laterally compressed with two well-separated pores positioned on the ventral side of the truncate apex; connective dilated dorso-medially into an elongate thickening. Ovary 6-celled, glabrous at the apex, which is elevated into a prominent cone 2–2.5 mm long on immature fruits but lacking a collar. Style somewhat declinate, glabrous, 1.9–2.2 cm long; the stigma subtruncate. Immature berry 1.3 × 1.5 cm. Seeds beige, mostly 1.5 mm long.

Distribution and phenology. A locally common species of wet forests known only from southeastern Costa Rica in a region extending from Helechales to Ciudad Neily west to the Las Lagunas area in adjacent Panama at 960–1400 m. Collected in flower in July and August, in fruit from August into March.

In general appearance *B. wilsoniorum* resembles *B. grandiflora* and *B. storkii*, both of which can also be free-standing trees or coarse epiphytic shrubs. All three of these species also have relatively large flowers with yellow anthers and white petals that are flushed with reddish pink apically and along the margins on the abaxial surface. *Blakea wilsoniorum* is readily distinguished from both of these species by its unappendaged anther connectives, consistently short floral peduncles (1–1.8 cm), and outer floral bracts that are fused for 1.3–1.7 cm basally but free apically with two flaring lobes that are broadly ovate to semicircular, obtuse to broadly rounded apically, and undulate-involute at the margins. In details of its inner floral bracts, *B. wilsoniorum* is most like *B. storkii*. In both species the inner bracts are fused for essentially their entire length to form an unlobed cupulate collar that closely envelops the hypanthium. In *B. storkii*, the outer floral bracts are somewhat shorter than the inner bracts such that the entire truncate apices of the fused inner bracts are always visible on flowering and fruiting hypanthia. In *B. wilsoniorum*, the outer floral bracts exceed and typically conceal the inner bracts.

Blakea wilsoniorum and *B. storkii* have overlapping geographic ranges, but the latter typically occurs at higher elevations (1500–2500 m), which accounts for the fact that they have never been found growing together. The allopatric *B. grandiflora*, with a more northern distribution centered in Costa Rica's Cordillera Central and northern Cordillera de Talamanca, also occurs at higher elevations (1500–2500 m) than *B. wilsoniorum*.

This species is named for the late Robert and Catherine Wilson, founders of the Robert and Catherine Wilson Botanical Garden, a part of the Las Cruces Biological Field Station of the Organization for Tropical Studies in southern Costa Rica. When the Wilsons went to Costa Rica in 1961 they had a vision of creating a unique mid-elevation tropical garden along a ridge of the Fila Zapote just south of the town of San Vito de Java. In creating this garden and preserving a rainforest reserve of 361.5 acres they established a haven for the survival of this species and a setting in which countless researchers, students, and the lay public from both Costa Rica and abroad have been inspired and educated about tropical biology.

Paratypes. COSTA RICA. **Puntarenas:** vicinity of Las Cruces Tropical Botanical Garden (now Wilson Botanical Garden) about 6.4 km S of San Vito de Java, 18 Mar. 1978 (fr), *Almeda et al. 4292* (CAS, CR); valley of the Río Negro between La Unión and Cortu, 8 Aug. 1974 (fl), *Croat 26546* (CAS); forest and edges on and around Wilsons' finca, 6 km S of San Vito de Java, 16 Aug. 1967 (fr), *Raven 21807* (CR, DUKE, MO); Helechales, 14 Feb. 1966 (fr), *Schnell 460* (US); vicinity of Finca Las Cruces, San Vito de Java, 22–25 Aug. 1968 (fl), *Schnell 1061* (CR, US); Finca Las Cruces, San Vito de Java, 20 Aug. 1969 (fl), *Schnell 1071* (CR); Finca Las Cruces, S of San Vito, 28 July 1977 (fl), *Webster et al. 22096* (CAS, CR, DAV). PANAMA. **Chiriquí:** Las Lagunas area W of El Hato del Volcán, 8°47′N, 82°40′W, 23 Aug. 1982 (fl), *Hamilton et al. 935* (CAS).

Acknowledgments. Fieldwork for this study was supported, in part, by U.S. National Science Foundation Grants DEB 76–83040, DEB 78–25620, BSR 8614880 (Flora Mesoamericana), and the G. Lindsay Field Research Fund and Nathan Jay and Virginia Friedman Fund of the California Academy of Sciences. For logistical support during field stud-

ies in Costa Rica and Panama over many years, I thank the Museo Nacional de Costa Rica, the Missouri Botanical Garden, the Organization for Tropical Studies, the Instituto Nacional de Biodiversidad, the Smithsonian Tropical Research Institute, and the Universidad de Panama. I am also grateful to Jenny Speckels for preparing the line drawings and the curators and staffs of the following herbaria for loans, gifts of specimens, and assistance during study visits: BM, BR, C, CAS, CR, DAV, DS, DUKE, F, G, INB, K, M, MA, MEXU, MICH, MO, NY, P, PMA, UC, US, USJ, WIS.

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Baimashania (Brassicaceae), a New Genus from China

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ABSTRACT. The new genus *Baimashania* and the new species *B. pulvinata* and *B. wangii* are described. The relationships and characters distinguishing *Baimashania* from *Solmslaubachia*, *Leiospora*, and *Pycnoplinthus* are discussed.

During a recent revision of *Solmslaubachia* Muschler for the forthcoming account of the Brassicaceae for the *Flora of China*, Al-Shehbaz and Yang (2000) excluded three collections previously misidentified as *S. ciliaris* (Bureau & Franchet) Botschantsev from the genus for subsequent studies. These three collections are placed herein in the new genus *Baimashania*. Except for the smaller flower size, the type specimen of *S. ciliaris* is indistinguishable in all other morphological aspects from that of the earlier published *S. pulcherrima* Muschler, a species highly variable in petal length and color. In fact, the type of *S. ciliaris* has petals ca. 1.5 cm long, while *S. pulcherrima* has petals (1.5–)1.7–2(–2.5) cm long. Therefore, the two are considered to be conspecific.

The recognition of *Solmslaubachia ciliaris* in various works (e.g., Lan & Cheo, 1981; Kuan, 1985; Lan, 1987; Wang, 1993; Ying et al., 1993; Li et al., 1995; Huang, 1997; Tan et al., 1999) basically followed Botschantsev (1955), who did not examine the type material of the species and erroneously interpreted its limits. In fact, illustrations and descriptions of *S. ciliaris* in these works are based on species of different genera. For example, the accounts in Kuan (1985), Wang (1993), and Ying et al. (1993) were based on one collection, *Qinghai-Xizang Team 73–399* (KUN, PE), which is a misidentified young plant of *Leiospora pamirica* (Botschantsev & Vvedensky) Botschantsev & Pachomova. By contrast, the descriptions and illustrations in Lan and Cheo (1981), Lan (1987), Li et al. (1995), and Tan et al. (1999) are based on a new species in a new genus herein described as *Baimashania pulvinata*, whereas the account in Huang (1997) is based on the new species *B. wangii*.

Baimashania is named after Baima Shan (sometimes spelled Beima Shan, Beimashan, or Paimashan), a mountain in northwestern Yunnan from which four of the five known collections of the genus are known. It differs from all nine species of *Solmslaubachia* (China, Sikkim) and six species of *Leiospora* (C. A. Meyer) Dvořák (China, Himalayas, and central Asia) in having median nectar glands confluent with the laterals, distinct and slender styles, flowers only to 4 mm long, fruit septa with a distinct midvein, obscurely veined, flat-margined fruit valves that are readily detached from replum at the fruit apex, replums readily distinguished from the valve margins, and narrow fruits (1–1.3 mm wide) persistent on the pedicel apex. By contrast, *Solmslaubachia* and *Leiospora* lack the median nectar glands and styles, and have much larger flowers 10–26 mm long, veinless fruit septa, prominently veined, marginally strongly angled fruit valves apically adnate to the replum, replums concealed by the valve margins, and broad fruits, (3–)5–15(–20) mm wide, readily detached from the pedicel apex. Furthermore, *Baimashania* also differs from *Solmslaubachia* by having forked trichomes mixed with simple ones and minutely reticulate seeds, while *Solmslaubachia* is glabrous or has only simple trichomes and has papillate, rugose, or coarsely reticulate seeds. It also differs from *Leiospora* by having entire stigmas, 6- to 12-ovuled ovaries, nonsaccate lateral sepals, and wingless seeds. *Leiospora* has prominently 2-lobed stigmas, 18- to 50-ovuled ovaries, saccate lateral sepals, and often winged seeds.

The first collection of *Baimashania, Forrest 19605* (see below), in July 1921 was misidentified by Edgar Evans as "*Braya* sp. aff. *forrestii* W. W. Smith." *Baimashania pulvinata* differs from *Braya forrestii* in having flattened, linear fruits, accumbent cotyledons, forked and simple trichomes, a confluent nectar ring, and much smaller, solitary flowers. By contrast, *Braya forrestii* has terete, ovoid fruits, incumbent cotyledons, exclusively simple trichomes, four separate nectar glands, and larger flowers in distinct racemes. In my opinion, *Baimashania* and *Braya* Sternberg & Hoppe are not related.

Perhaps *Baimashania* is most similar to *Pycnoplinthus* O. E. Schulz (one species; China, India, Kashmir, Pakistan), with which it shares the perennial, pulvinate, scapose habit, solitary pink flowers, persistent entire leaves, thickened petioles, obtuse

anthers, 6- to 12-ovuled ovaries, linear flattened fruits, entire stigmas, and uniseriate wingless seeds. However, it differs by having branched trichomes, free sepals, distinct median glands confluent with the laterals, obscurely veined valves, and accumbent cotyledons. *Pycnoplinthus* consists of glabrous plants with united sepals, no median nectar glands, prominently veined valves, and incumbent cotyledons.

Baimashania Al-Shehbaz, gen. nov. TYPE: *Baimashania pulvinata* Al-Shehbaz.

Herba perennis scaposa pulvinata, caudice ramoso. Folia basalia rosulata, integra, persistentia, pilis simplicibus et furcatis, petiolis crassis complanatis, ciliatis. Racemi 2- vel 3-flori vel flores solitarii. Sepala oblonga nonsaccata. Petala rosea, spathulata, obtusa. Glandulae nectariferae confluentes. Ovula 6–12. Fructus lineares valde compressi glabri; valvis longitudinaliter striatis nontorulosis; stylo tenui ad 1 mm longo; stigmata integra. Semina uniseriata, oblonga; cotyledones accumbentes.

Herbs perennial, scapose, pulvinate, with a well-developed, few- to many-branched caudex covered by leaves or leaf remains of previous years. Trichomes simple mixed with stalked, 1-forked ones, restricted to leaves. Stems absent. Basal leaves petiolate, rosulate, simple, entire, persistent, with stramineous, thick, basally flattened, ciliate petioles. Cauline leaves absent. Racemes 2- or 3-flowered and ebracteate, or flowers solitary on short pedicels originating from axils of rosette leaves. Fruiting pedicels slender, erect to ascending, often hidden among basal leaves. Sepals oblong, deciduous, erect, equal, base of inner pair not saccate, margin membranous. Petals pink; blade spatulate, apex obtuse; claw slightly differentiated from blade, subequaling sepals. Stamens 6, slightly tetradynamous; filaments not dilated at base; anthers oblong, not apiculate at apex. Nectar glands confluent and subtending bases of all stamens; median nectaries present. Ovules 6 to 12 per ovary. Fruit dehiscent, capsular siliques, linear, strongly latiseptate, sessile; valves with an obscure midvein, glabrous, not torulose, longitudinally striate; replum rounded, visible; septum complete, membranous, with a distinct midvein; style slender, to 1 mm long; stigma capitate, entire. Seeds uniseriate, wingless, oblong; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Two species: endemic to China (Yunnan and Qinghai provinces).

KEY TO THE SPECIES OF *BAIMASHANIA*

1a. Leaves ovate to oblong, densely pilose throughout; flowers solitary; ovules 6 to 8 per ovary; Yunnan . . . . . 1. *B. pulvinata*

1b. Leaves linear, glabrous except for ciliate petiole margins and a tuft at leaf apex; flowers mostly in 2- or 3-flowered racemes; ovules 10 to 12 per ovary; Qinghai . . . . . 2. *B. wangii*

1. Baimashania pulvinata Al-Shehbaz, sp. nov. TYPE: China. Yunnan: Deqen, Baima Shan, N side of road, limestone rock crevices, 28°23′N, 99°01′E, 4350 m, 30 June 1994, *Alpine Garden Society Expedition to China ACE 829* (holotype, K; isotype, MO).

Herba pulvinata 0.5–2 cm alta, caudice multiramoso. Folia basalia ovata vel oblonga, 2–4 × 1–2 mm, subcarnosa, omnino dense pilosa. Flores solitarii. Pedicelli fructiferi 3–5 mm longi. Sepala oblonga 1.5–2.5 × ca. 1 mm. Petala rosea, 3–4 × 1–1.5 mm; ungues 1.5–2 mm longi. Ovula 6–8. Fructus lineares, 4–8 × 1–1.3 mm; stylo 0.4–1 mm longo. Semina 1–1.5 × 0.6–0.9 mm.

Herbs pulvinate, 0.5–2 cm tall; caudex many branched, to 3 mm diam. Trichomes simple, to 1 mm long, mixed with fewer forked stalked ones, restricted to leaves. Basal leaves rosulate; petiole 2–5 mm long, expanded at base and 0.5–1 mm wide, ciliate, persistent; leaf blade ovate to oblong, 2–4 × 1–2 mm, somewhat fleshy, densely pilose throughout, base subattenuate, margin entire, apex obtuse. Flowers solitary. Fruiting pedicel slender, 3–5 mm long, ascending, glabrous. Sepals oblong, 1.5–2.5 × ca. 1 mm. Petals pink, spatulate, 3–4 × 1–1.5 mm; claw 1.5–2 mm long. Filaments 2–2.5 mm long; anthers 0.3–0.5 mm long. Ovules 6 to 8 per ovary. Fruit linear, 4–8 × 1–1.3 mm; valves longitudinally striate, without a distinct midvein; style 0.4–1 mm long. Seeds 1–1.5 × 0.6–0.9 mm. Flowering June–July, fruiting July–August.

Habitat. Moist gravelly meadows, limestone rock crevices; 4200–4600 m. Yunnan.

Baimashania pulvinata was illustrated in Lan (1987) as *Solmslaubachia ciliaris*. The illustration accurately shows the habit of the plant, leaf shape and trichomes, and mature fruit, and, therefore, should be consulted for reference. The holotype was misidentified as *Braya* cf. *forrestii*, though nothing was mentioned about it in the detailed account of the expedition that led to its discovery (Grey-Wilson, 1996).

Paratypes. CHINA. **Yunnan:** Baima Shan, 28°18′N, 99°10′E, *G. Forrest 19605* (E, K, US); Atuntze, Baima Shan, Shulung, *T. T. Yü 9324* (KUN, PE); Deqen, Baima Shan, *Qing-Zang Team 2779* (KUN); Deqin Xian, Baima Shan, mts. N of W pass, 28°23′N, 99°01′E, *Aldén, Alexander, Long, McBeath, Noltie & Watson 765* (E).

2. Baimashania wangii Al-Shehbaz, sp. nov. TYPE: China. Qinghai: Nangqen Xian, Xiaoqu, S bend, under rocks, 13 June 1982, 4100 m, *Wang Weiyi 0011* (holotype, HNWP; fragment, MO).

Herba pulvinata 1–1.5 cm alta, caudice pauciramoso. Folia linearia, 4–15 × 0.5–1.5 mm, subcarnosa, praeter apicem pilosam glabra, petiolibus ciliatis. Racemi fructiferi 2- vel 3-fructi vel fructus solitarii. Pedicelli fructiferi 3–5 mm longi. Flores ignoti. Ovula 10–12. Fructus lineares, 0.7–1.3 cm × ca. 1 mm; stylo 0.4–0.7 mm longo. Semina ignota.

Herbs pulvinate, 1–1.5 cm tall; caudex few branched, to 6 mm diam. Trichomes simple, to 1 mm long, restricted to petiole margins and leaf apices, these mixed at leaf apex with fewer forked stalked ones. Basal leaves rosulate; petiole 2–5 mm long, expanded at base and 0.5–1.5 mm wide, ciliate; leaf blade linear, 4–15 × 0.5–1.5 mm, somewhat fleshy, base attenuate, margin entire, apex with a tuft of hairs, obtuse. Fruiting racemes with 2 or 3 fruits, sometimes fruits solitary. Fruiting pedicel slender, 3–5 mm long, ascending, glabrous. Flowers not seen. Ovules 10 to 12 per ovary. Fruit linear, 0.7–1.3 cm × ca. 1 mm; valves not torulose; style 0.4–0.7 mm long. Mature seeds not seen. Fruiting June.

Baimashania wangii, which is named after the collector of the holotype, is known thus far only from the type collection. The type was annotated in 1995 by Huang Rong-fu as *Solmslaubachia ciliaris*, and it is very likely that the record of *S. ciliaris* from Qinghai (Huang, 1997) was erroneously based on the holotype of *B. wangii*.

Acknowledgments. I am indebted to Henk van der Werff for correcting the Latin. I thank Sue Zmarzty for her permission to deposit at MO an isotype of *Baimashania pulvinata*. I also thank the directors and curators of the herbaria cited, as well as Zhu Guanghua, He Si, and Song Hong for their help in the translation of labels from Chinese.

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New or Noteworthy Species of *Cardamine* (Brassicaceae) from China

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ABSTRACT. *Cardamine changbaiana*, *C. fargesiana*, and *C. lihengiana* are described as new, and their relationships and distinguishing characters are discussed. The new combination *C. purpurascens* is proposed, and a detailed description and specimen citation of this poorly understood species of *Cardamine* are provided.

During revision of the Brassicaceae for the forthcoming volume 8 of the *Flora of China*, it became necessary to provide formal description of the following novelties to make the names available for this volume.

Cardamine changbaiana Al-Shehbaz, sp. nov. TYPE: China. Jilin: Changbai Shan, Tianchi, rocky slopes, 2600 m, 1 Aug. 1957, *Qian Jiaju 580* (holotype, PE).

Herba perennis scaposa, glabra, rhizomata, 2–8 cm alta. Folia basalia rosulata, ovata, subcordata, vel oblonga, simplicia vel triloba, 2–10 × 1.5–8 mm; petiolis nonauriculatis, 0.3–3.5 cm longis. Folia caulina nulla vel unum. Pedicelli fructiferi 2–7 mm longi, erecti. Sepala oblonga, 1.3–1.7 × 0.6–0.8 mm. Petala alba, obovata, 3–3.5 × 1.5–1.8 mm. Fructus lineares, 1–2 cm × 1.3–2 mm; stylo 0.5–2 mm longo. Semina oblonga vel oblongo-ovata, 1.2–1.5 × 0.8–1.1 mm.

Perennial herbs 2–8 cm tall, scapose, glabrous throughout. Rhizome slender, 0.4–0.7 mm diam. Stems erect, leafless, or rarely 1-leaved. Basal leaves rosulate, fleshy; petiole 0.3–3.5 cm long; leaf blade simple or rarely 3-lobed, broadly ovate, subcordate, or oblong, 2–10 × 1.5–8 mm, cordate to obtuse, margins entire or repand, apex rounded to obtuse. Cauline leaves absent, rarely 1 and petiolate, similar but narrower than basal leaves, petiole base not auriculate. Racemes terminal, 2- to 5(to 7)-flowered, ebracteate. Fruiting pedicels erect to subascending, 2–7 mm long, straight. Sepals oblong, 1.3–1.7 × 0.6–0.8 mm. Petals white, obovate, 3–3.5 × 1.5–1.8 mm, base tapering into claw 0.4–1 mm long, apex rounded to subemarginate. Filaments 1.4–2 mm long; anthers oblong, 0.6–0.8 mm long. Ovules 8 to 12 per ovary. Fruit linear, 1–2 cm × 1.3–2 mm; gynophore 0.3–1 mm long; valves smooth, glabrous; style 0.5–2 mm long. Seeds brown, oblong to oblong-ovate, 1.2–1.5 × 0.8–1.1 mm, neither winged nor margined.

Phenology. Flowering and fruiting in July and August.

Habitat. Rocky slopes on wet soil; elevation 2500–2600 m.

Distribution. China (Jilin Province).

On the basis of Nakai's (1914) original description of *Cardamine resedifolia* L. var. *morii* Nakai, it appears that the variety is the same as *C. changbaiana*, sharing similar plant size, fruit length, and long-petiolate leaves. For reasons discussed below, however, I prefer to describe the taxon as a new species instead of proposing a new combination without examining the two syntypes of that variety. Nakai (1914) indicated that the petals of variety *morii* are 5 mm long and the leaves are lyrate, but in the three specimens of *C. changbaiana* available for my study, the petals are 3–3.5 mm long and the leaves are simple.

Cardamine changbaiana is clearly very different from the European *C. resedifolia* in a number of features. The former has petals 3–3.5 mm long, wingless seeds, oblong anthers 0.6–0.8 mm long, leafless or 1-leaved stems, nonauriculate petiolar bases, smooth fruit valves, 8 to 12 ovules per ovary, and undivided cauline leaves. By contrast, *C. resedifolia* has petals 5–6 mm long, broadly winged seeds (wing ca. 0.5 mm diam.), ovate anthers 0.2–0.4 mm long, leafy stems, strongly auriculate to amplexicaul petiolar bases, torulose valves, 20 to 30 ovules per ovary, and pinnatisect to deeply ternate cauline leaves (Akeroyd, 1993; Schultze-Motel, 1986). Furthermore, the type locality of *C. changbaiana* is separated by about 10,000 air miles from the nearest site of *C. resedifolia* in Rumania (Jalas & Suominen, 1994), and I prefer not to recognize the two as varieties of a single species. *Cardamine changbaiana* and *C. resedifolia* are well illustrated in Cheo (1987) and Schultze-Motel (1986), respectively.

The nearest relative of *Cardamine changbaiana* is *C. nipponica* Franchet & Savatier (Japan, Taiwan). The former has leafless or rarely 1-leaved stems, simple or rarely 3-lobed basal leaves, nonauriculate petioles, obovate petals 3–3.5 mm, and

marginless seeds. By contrast, *C. nipponica* has 2- or 3-leaved stems, (3)- or 5- or 7-foliolate basal leaves, cauline leaves with auriculate to amplexicaul petiolar bases, spatulate petals 5–6 mm, and apically margined seeds.

Paratypes. CHINA. **Jilin:** Antu County, NNE slope of volcano Chang Bai Shan, 2500 m, 23 July 1986, *Hong Deyan, W. H. Sauer, S. Gerbert & Yang Ye 32829* (PE); Chang Bai Shan, between Nidoli and Tianchi, 2500 m, 22 July 1950, *M. Noda 451* (LE).

Cardamine purpurascens (O. E. Schulz) Al-Shehbaz, T. Y. Cheo, L. L. Lou & G. Yang, comb. nov. Basionym: *Cardamine microzyga* O. E. Schulz var. *purpurascens* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 11: 225. 1931. TYPE: China. SW Sichuan: Kulu mountains, E of Muli Gomba, 4300 m, June 1928, *J. F. Rock 16487* (lectotype, here designated, B; isolectotypes, E, MO, US).

Perennial herbs (8–)10–25(–30) cm tall, pilose; rhizomes stout, 0.5–1.5 cm long, often with several stolons. Stems erect, simple, pilose. Basal leaves rosulate, 5–10 cm long; petiole 1–3.5 cm long, ciliate; terminal leaflet subreniform to orbicular, 4–8 × 4–10 mm, petiolule 1–3 mm long, base rounded to cordate, margin entire to obscurely and obtusely 3–5-lobed; lateral leaflets 3 to 7 pairs, obovate to suborbicular, symmetric or not, slightly smaller than terminal lobe, entire or obscurely toothed, apex rounded. Cauline leaves 2 to 10, 1–5 cm long; petiole (2–)4–10(–15) mm long, ciliate, not auriculate at base; terminal leaflet linear, oblong, or lanceolate, 3–9 × 0.5–2 mm, sessile or petiolule to 1.5 mm long; lateral leaflets 4 to 7 pairs, narrowly oblong to oblong-ovate, subequaling terminal leaflet, symmetric or not, pilose, base oblique or cuneate, proximal margin entire or 1-toothed, distal margin entire, apex acute. Racemes terminal, many-flowered. Flowering pedicel ascending to divaricate-ascending, 1–3 cm long, slender, pilose, not appressed to rachis. Sepals oblong to ovate, 3–4 × 1.5–2 mm, pilose, margin membranous, base of lateral pair saccate. Petals magenta-red, purple, or lavender, broadly obovate, 7–11 × 3–6 mm, cuneate into clawlike base to 2 mm long, apex rounded. Median filament pairs 4–5 mm long, flattened below anther; lateral pair 2.5–3.5 mm long; anthers narrowly oblong, 0.9–1.2 mm long. Ovules 10 to 14 per locule. Fruit and seeds not seen.

Phenology. Flowering May through July.

Habitat. River banks, wood margins, marshy places, swampy meadows, *Rhododendron* scrub; elevation 3500–4400 m.

Distribution. Endemic to China (SW Sichuan and adjacent Yunnan).

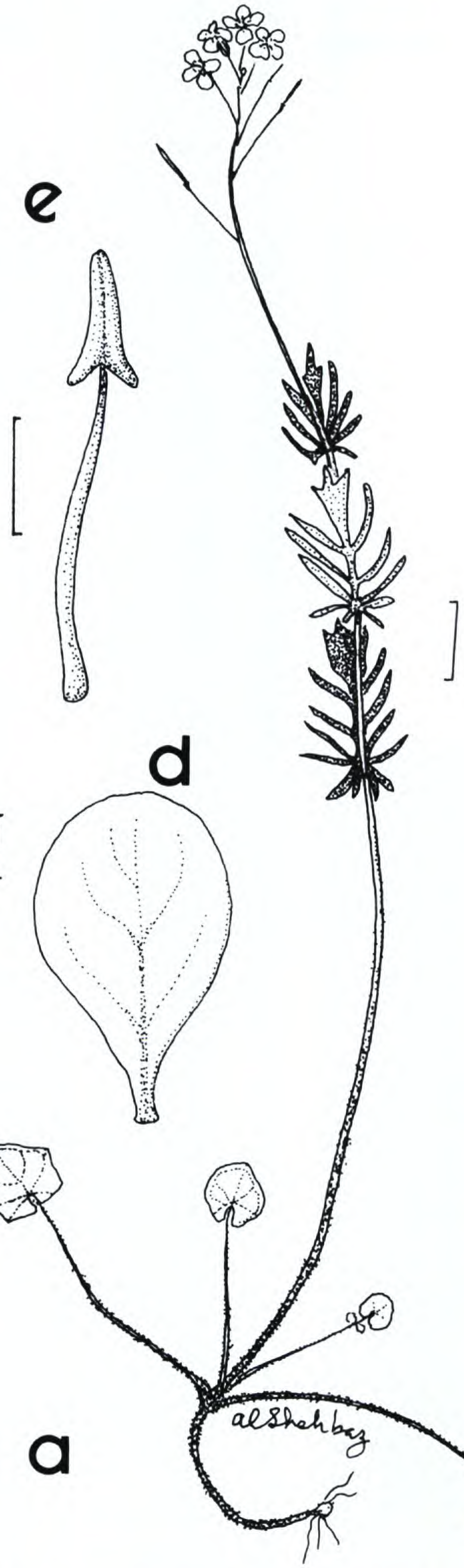
Specimens examined. CHINA. **Sichuan:** Litang-Ya-lung divide, *Kingdon Ward 4377* (E); Muli or Mili Kingdom, *Rock 6462* (GH, P, US, W); mountains between Litang and Yalung rivers, between Muli Gomba and Baurong and Wa-Erh-Dje, *Rock 16655* (F, US, W); between Baurong and Kulu, W of Yalung River, *Rock 17842* (GH, P, US); Muli, Ha-lu, *Yü 6990* (A, PE). **Yunnan:** Zhongdian, road to Haba Shan, 27°44′05″N, 99°58′09″E, *ACE 224* (K).

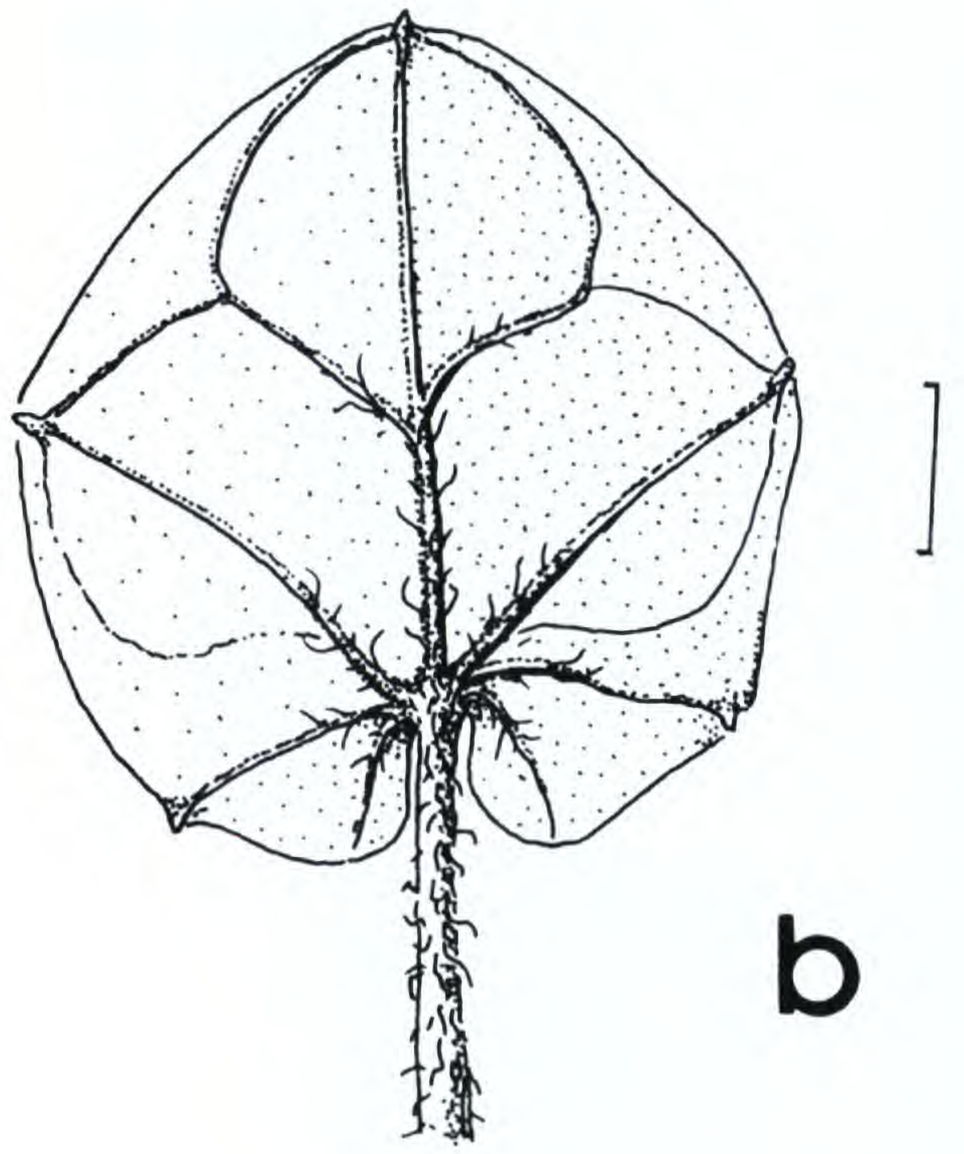
Although Schulz (1931) cited four syntypes of *Cardamine microzyga* var. *purpurascens*, the taxon was not lectotypified by Lan and Cheo (1981) when it was raised to specific rank under *Loxostemon* J. D. Hooker & Thomson. The flattened median staminal filaments were used by Lan and Cheo as the basis for inclusion of the species in *Loxostemon*, but as indicated by Al-Shehbaz and Yang (1998), this genus is artificially separated from *Cardamine* solely on the basis of that staminal character.

Cardamine purpurascens is most closely related to *C. microzyga* from which it is readily distinguished by having much thickened, stoloniferous, short (0.5–1.5 cm) rhizomes, divaricate-ascending to ascending pedicels not appressed to the rachis, and often entire lateral leaflets of upper leaves that are markedly narrower than those of the basal leaves. By contrast, *C. microzyga* has slender, non-stoloniferous, very long (at least 5 cm long) rhizomes, erect fruits and fruiting pedicels appressed to the rachis, and coarsely 1- or 2-toothed lateral leaflets of the cauline leaves that are more or less similar to those of the basal leaves. *Cardamine purpurascens* was reduced by Li et al. (1995) to synonymy of *C. microzyga*, but the two are sufficiently different to be recognized as distinct species. On the other hand, the treatment by Tan et al. (1999) of the two species in different genera (as *Loxostemon purpurascens* and *C. microzyga*) clearly distorts their close relationship.

Cardamine fargesiana Al-Shehbaz, sp. nov. TYPE: China. Sichuan: Tchen-kéou-tin, no specific locality or date given, *R. P. Farges 1341 bis* (holotype, P; isotype, P). Figure 1.

Herba perennis 8–23 cm alta, caulibus rhizomatibus et stolonibus crispo-pilosis, caulibus distalibus glabris. Folia basalia orbiculata, 5–12 mm diam., palmatinervia, abaxialiter glabra, adaxialiter pilosa. Folia caulina pinnatisecta, sessilia, lobis terminalibus obovatis, tridentatis; lobis lateralibus 4–6 jugis, linearibus vel lineari-lanceolatis, integris. Racemi 3–7 flori. Pedicelli floriferi 5–12 mm longi. Sepala ovata, 2.5–3 × 1.2–1.6 mm, glabra, lateralia saccata. Petala alba, obovata, 5–6 × 2.5–3 mm. Filamenta mediana 3–3.5 mm longa, filamenta lateralia 2–2.5 mm





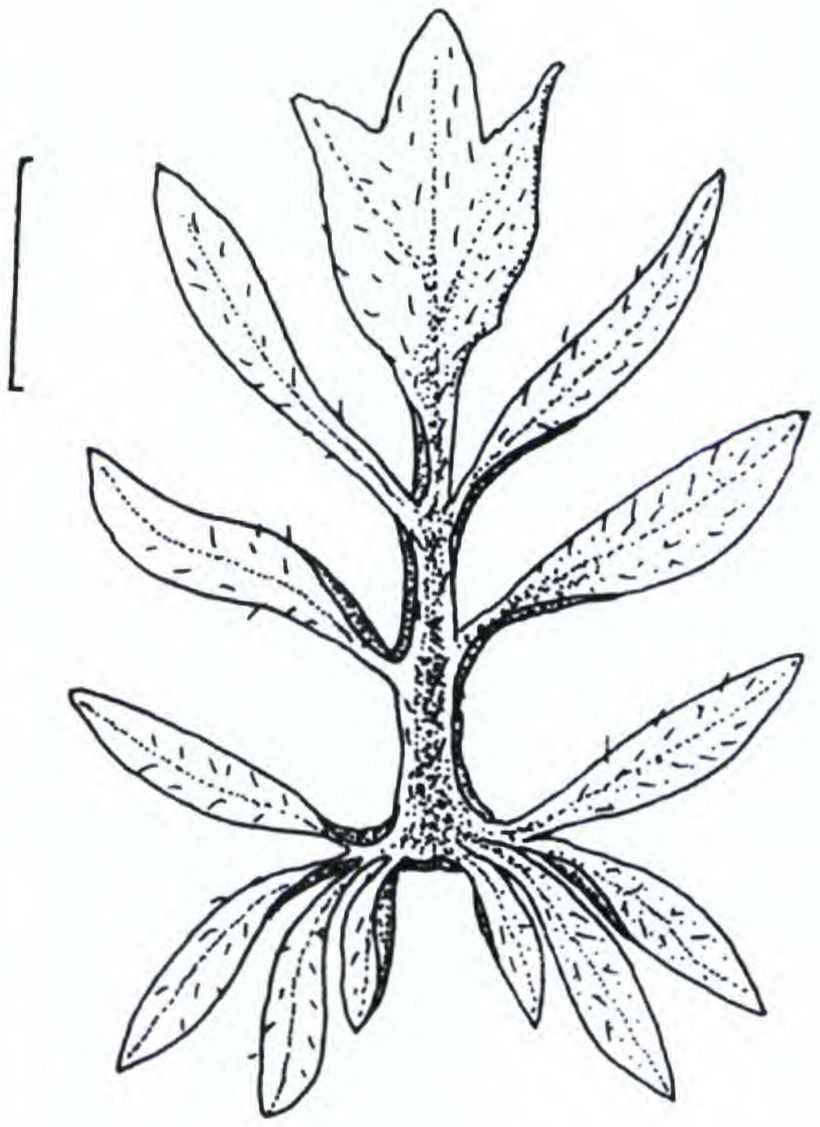


Figure 1. *Cardamine fargesiana* Al-Shehbaz. —A. Plant. —B. Basal leaf abaxial view. —C. Cauline leaf adaxial view. —D. Petal. —E. Median stamen. Scale: A = 1 cm; B = 2 mm; C = 5 mm; D, E = 1 mm. Drawn by Al-Shehbaz from the holotype (*Farges 1341 bis*).

longa; antherae oblongae, 0.8–1.1 mm longae, basi sagittatae. Fructus et semina ignota.

Perennial herbs 8–23 cm tall. Rhizome ovoid to oblong, 2–5 × 1.5–2 mm. Stolons slender, densely pilose with crisped trichomes, thickened at plant base. Stems simple, erect, densely crisped pilose at base, gradually sparser upward, completely glabrous at raceme. Basal leaves 1 to 4 per plant, simple or rarely with a pair of leaflet-like lobes; petiole 0.5–4.5 cm long, densely crisped pilose; leaf blade orbicular, 5–12 mm diam., palmately 5-veined, abaxially glabrous or sparsely pilose along proximal portion of veins, adaxially pilose with simple, straight trichomes to 0.5 mm long, base cordate, margin entire or obscurely 5-angled, mucronate at vein tips; principal veins prominent abaxially, not branched, connected near margin. Cauline leaves 3 to 5, 0.9–2.2 × 0.7–1.5 cm, broadly ovate to oblong in outline, pinnatisect, abaxially glabrous, adaxially pilose; petiole absent and leaf base appearing auriculate; rachis 2–15 mm long; terminal lobe of lowermost leaf obovate, 4–14 × 2–6 mm, apically 3-toothed, sometimes with a minute tooth subbasally on each side, base cuneate into a petiolule to 3 mm long, margin entire, apex mucronate; lateral lobes 4 to 6, linear to lanceolate-linear, margin entire, apex acute, proximal 2 to 4 lobes attached at one point on each side of rachis. Uppermost leaves shorter and with narrower lobes. Racemes 3- to 7-flowered. Flowering pedicels ascending, 5–12 mm long, straight, glabrous. Sepals ovate, 2.5–3 × 1.2–1.6 mm, glabrous, margin and apex membranous, lateral pairs saccate. Petals white, broadly obovate, 5–6 × 2.5–3 mm, apex rounded. Median filament pairs 3–3.5 mm long, slender, lateral pair 2–2.5 mm long; anthers oblong, 0.8–1.1 mm long, base sagittate. Pistil glabrous; style 1–1.5 mm long; stigma entire. Fruits and seeds not seen.

Cardamine fargesiana is one of the most distinctive of all Asian species of *Cardamine*. It is readily distinguished by its strongly dimorphic leaves: the basal leaves are simple, orbicular, and palmately veined, whereas the cauline leaves are sessile, pinnatisect, and have a 3-lobed terminal lobe and linear to linear-lanceolate lateral lobes the proximal pair of which is auricle-like (Fig. 1). Although *C. fargesiana* does not appear to be closely related to any other species, it belongs to a group of six species that have sessile cauline leaves with auricle-like proximal leaflets or leaf lobes. This group includes *C. lyrata* Bunge, *C. griffithii* J. D. Hooker & Thomson, *C. hygrophila* T. Y. Cheo & R. C. Fang, *C. engleriana* O. E. Schulz, *C. multijuga* Franchet, and *C. gracilis* (O. E. Schulz) T. Y. Cheo & R. C. Fang.

Paratype (perhaps unnumbered type collection). China. **Sichuan:** Tchen-kéou-tin, no specific locality or date given, *R. P. Farges s.n.* (P).

Cardamine lihengiana Al-Shehbaz, sp. nov. TYPE: China. Yunnan: Yiliang, Xia Cao Ba, 1900 m, 16 June 1982, *Li Heng, Chen Yü & Yü Hongyuan 1267* (holotype, KUN; isotype, KUN). Figure 2.

Herba perennis rhizomata, 30–50 cm alta, glabra. Rhizofolia et folia caulina inferiora petiolata, reniformia vel suborbiculata, 0.7–2.5 × 1–3 cm, palmatinervia, repandocrenata, 5- vel 7-angulata, petiolis nonauriculatis. Racemi omnino bracteati, laxi. Pedicelli fructiferi 1.5–3 cm longi, recti, ascendentes. Sepala ovata, 1.5–1.8 × 0.9–1 mm, nonsaccata. Petala alba, obovata, 3.5–4.5 × 1.5–2 mm. Fructus lineares, 2–3.6 cm longi, glabri; stylo 1–2 mm longo. Semina oblonga, 1.2–1.4 × 0.7–0.9 mm, nonalata.

Perennial herbs 30–50 cm tall, glabrous throughout. Rhizomes slender, without stolons. Stems erect, angled, with long internodes usually more than 2 cm. Rhizomal and lower cauline leaves simple; petiole 1–4 cm long, not auriculate at base; leaf blade reniform to suborbicular, 0.7–2.5 × 1–3 cm, palmately veined, base cordate, margin repand-crenate, obscurely to distinctly 5- or 7-angled, apex obtuse, obscurely mucronulate. Middle and upper cauline leaves bearing axillary flowers, simple or rarely 1 or 2 with a lateral, leaflet-like lobe, suborbicular to ovate, angled, not crenate, progressively smaller upward. Raceme bracteate throughout, very lax. Fruiting pedicels ascending, 1.5–3 cm long, slender, straight. Sepals ovate, 1.5–1.8 × 0.9–1 mm, apex membranous, base not saccate. Petals white, obovate, 3.5–4.5 × 1.5–2 mm, not clawed, apex rounded. Median filament pairs ca. 2.5 mm long, lateral pair ca. 2 mm long; anthers oblong, ca. 0.6 mm long. Ovules 20 to 24 per ovary. Fruit linear, 2–3.6 cm × ca. 1 mm, sessile; valves glabrous, smooth; style 1–2 mm long. Seeds brown, oblong, 1.2–1.4 × 0.7–0.9 mm, wingless.

Phenology. Flowering and fruiting in June.

Cardamine lihengiana is dramatically different from all Eurasian species of the genus in having very lax racemes that are bracteate throughout. There are several American species of *Cardamine* with bracteate inflorescences, but the new species is clearly unrelated to them because it has palmately instead of pinnately veined leaves. *Cardamine lihengiana* is most closely related to the species group including *C. circaeoides* J. D. Hooker & Thomson and its relatives. This group has simple,

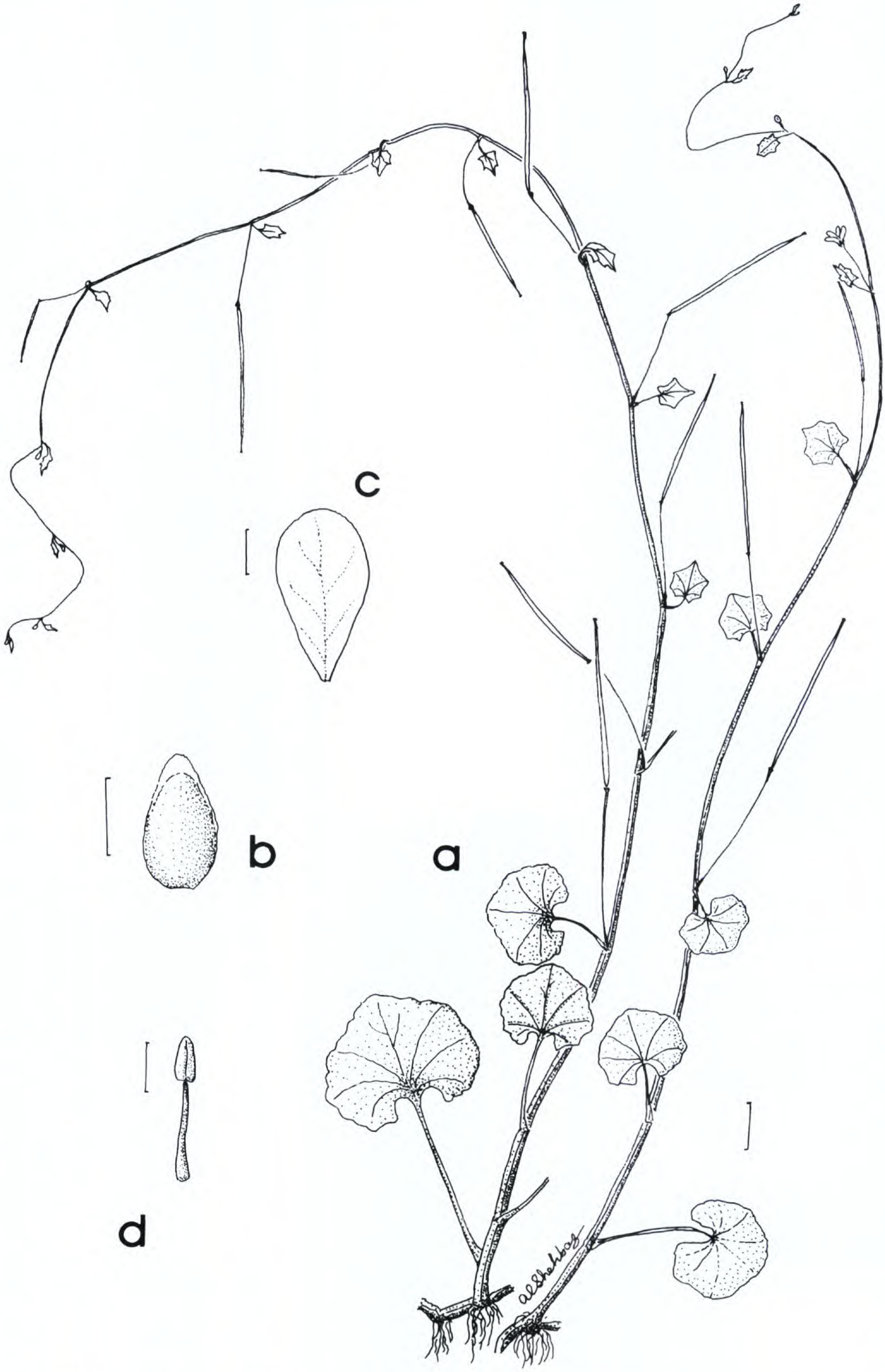


Figure 2. *Cardamine lihengiana* Al-Shehbaz. —A. Plant. —B. Sepal. —C. Petal. —D. Median stamen. Scale: A = 1 cm; B–D = 1 mm. Drawn by Al-Shehbaz from the holotype (*Li Heng, Chen Yü & Yü Hongyuan 1267*).

reniform, palmately veined leaves, short rhizomes, and small, white flowers. The new species is named after Professor Li Heng (KUN), one of the collectors of the type collection.

Acknowledgments. I am grateful to Henk van der Werff for checking the Latin. I thank Guanghua Zhu and Song Hong for their help with the translation of herbarium labels from the Chinese. I also thank the directors and curators of the herbaria cited in this paper.

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Lepidostemon (Brassicaceae) is No Longer Monotypic

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ABSTRACT. Previously monotypic *Lepidostemon* is expanded to include five species, of which *L. everestianus* and *L. gouldii* are herein described as new. The new combinations *L. rosularis* and *L. glaricola* are proposed. The genus is reported for the first time from China. *Chrysobraya* is reduced to synonymy of *Lepidostemon*.

Lepidostemon has been recognized as monotypic since the original description of *L. pedunculosus* J. D. Hooker & Thomson as the generic type (Hooker & Thomson, 1861). Except for the treatments by Hayek (1911) and Schulz (1936), the genus was never studied in context with other Himalayan genera in Brassicaceae (Cruciferae). As shown below, of the five species of *Lepidostemon*, one was described in the monotypic genus *Chrysobraya* H. Hara (as *C. glaricola* H. Hara) and another in *Christolea* Cambessèdes (as *C. rosularis* K. C. Kuan & Z. X. An). However, neither of these two species was compared with *L. pedunculosus*.

In his original description of *Chrysobraya*, Hara (1974) indicated that the genus is most closely allied to *Braya* Sternberg & Hoppe and listed several similarities, including aspects of their nectar glands, cotyledonary position, ebracteate racemes, and branched trichomes. Although the trichomes in *Chrysobraya* are branched, they are almost exclusively dendritic, whereas in *Braya* these trichomes are simple and unbranched, and are only forked. Furthermore, the persistence of all floral parts well after fruit dehiscence in *Chrysobraya* in contrast to their abscission immediately after anthesis in *Braya* does not support any close affiliation. *Chrysobraya* is morphologically similar to *Lepidostemon*, with which it shares trichome aspect, persistent floral parts, toothed nectaries, coarsely toothed leaves, yellow petals, and solitary early flowers. However, *Chrysobraya* differs from *Lepidostemon* in having cotyledons incumbent instead of accumbent and staminal filaments toothless and wingless instead of winged and toothed. Several genera of the Brassicaceae (e.g., *Alyssum* L., *Dontostemon* Andrzejowski ex C. A. Meyer) include species with both toothed or toothless and winged or wingless staminal filaments (Al-Shehbaz, 1987; Al-Shehbaz & Ohba, 2000), and the cotyledonary position has often been shown to be an unreliable generic character. Therefore, *Chrysobraya* is reduced to synonymy of *Lepidostemon*.

As delimited herein, *Lepidostemon* consists of five, exclusively Himalayan species distributed in Bhutan, China (Xizang), Nepal, and Sikkim. It is characterized by having branched trichomes sometimes mixed with simple ones (but at least some are dendritic), floral parts (sepals, petals, and stamens) persisting well after fruit maturity, winged and often toothed median staminal filaments, as well as linear or linear-oblong, often torulose fruits. It should be noted that one species, *L. glaricola*, has slender, toothless filaments, and another, *L. gouldii*, has floral parts that fall off shortly after anthesis. However, these two species show such remarkable morphological similarities in other characters to *L. pedunculosus* that they may reliably be included in *Lepidostemon*. From both *Streptoloma* Bunge (2 species, central Asia) and *Braya*, *Lepidostemon* is readily distinguished by having toothed and/or winged median staminal filaments, persistent floral parts, and often some dendritic trichomes. Both *Braya* and *Streptoloma* have wingless and toothless median staminal filaments, readily deciduous floral parts, and no dendritic trichomes. *Braya* has simple and/or forked stalked trichomes, whereas *Streptoloma* has almost exclusively malpighiaceous ones.

Lepidostemon J. D. Hooker & Thomson, J. Linn. Soc., Bot. 5: 131. 1861. TYPE: *Lepidostemon pedunculosus* J. D. Hooker & Thomson.

Chrysobraya H. Hara, J. Jap. Bot. 49: 193. 1974. TYPE: *Chrysobraya glaricola* H. Hara.

Herbs annual or caespitose perennial. Trichomes dendritic, forked and stalked, submalpighiaceous, or simple, often more than one kind present. Stems erect, simple from rosettes, leafy or leafless. Basal leaves petiolate, rosulate, simple, entire or dentate. Cauline leaves similar to basal, sometimes pinnatifid, rarely absent. Racemes few to many flowered, ebracteate or rarely bracteate throughout, elongated or not elongated in fruit, sometimes flowers solitary on long pedicels originating from axils of rosette leaves. Fruiting pedicels slender, divaricate or recurved. Sepals oblong, persistent or rarely cadu-

cous, base not saccate, margin membranous. Petals yellow, white, lavender, or purple; blade broadly obovate or rarely spatulate, apex rounded or emarginate; claws subequaling sepals. Stamens 6, tetradynamous; filaments winged or rarely wingless, toothed or rarely toothless; anthers reniform or rarely oblong, not apiculate at apex. Nectar glands 4, lateral; median nectaries absent. Ovules 8 to 28 per ovary. Fruit dehiscent siliques, linear-oblong to linear, terete or latiseptate, sessile; valves papery, obscurely veined, rarely marginal veins prominent, pubescent, torulose or rarely smooth; replum rounded, visible; septum complete or rarely perforated, membranous; style distinct, to 2 mm long; stigma capitate, entire or rarely slightly 2-lobed. Seeds uniseriate, wingless, oblong or ovate, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent or rarely incumbent.

Five species: Bhutan, China (Xizang), Sikkim, and Nepal.

KEY TO THE SPECIES OF *LEPIDOSTEMON*

1a. Racemes bracteate throughout; leaf trichomes almost exclusively simple; anthers oblong, 0.7–0.9 mm long . . . . . 3. *L. everestianus*

1b. Racemes ebracteate, rarely lowermost few flowers bracteate, leaf trichomes dendritic, submalpighiaceous, forked or simple; anthers reniform, 0.3–0.5(–0.6) mm long.

2a. Perennials; trichomes crisped, almost exclusively dendritic; filaments slender; nectar glands clavate, 0.5–1 mm long; cotyledons incumbent; petals bright yellow; stems leafless . . . . . 5. *L. glaricola*

2b. Annuals; trichomes not crisped, simple, forked, dendritic, or submalpighiaceous, often a mixture of more than one type; filaments flattened; nectar glands ovate, 0.1–0.3(–0.4) mm long; petals purple, lavender, white, or light yellow; cotyledons accumbent (unknown in *L. gouldii*); stems leafy.

3a. Fruit strongly flattened, not torulose, 2.5–3 mm wide; valve margin thickened, with prominent marginal veins; median filaments toothless; seeds ovate . . . . . 4. *L. rosularis*

3b. Fruit terete, torulose, ca. 1 mm wide; valve margin not thickened, with obscure marginal veins; median filaments toothed; seeds oblong.

4a. Petals purple to lavender, rarely white; sepals, petals, and stamens deciduous shortly after flowering and before fruit maturity; racemes elongated in fruit; fruiting pedicels recurved; leaf trichomes predominantly simple; fruit with stalked forked and dendritic trichomes . . . . . 2. *L. gouldii*

4b. Petals yellow; sepals, petals, and stamens persistent well after fruit maturity; racemes not elongated in fruit; fruiting pedicels straight; leaf trichomes primarily dendritic and submalpighiaceous; fruit with submalpighiaceous sessile trichomes . . . . . 1. *L. pedunculosus*

1. Lepidostemon pedunculosus J. D. Hooker & Thomson, J. Linn. Soc., Bot. 5: 156. 1861. TYPE: Sikkim. Alt. 14,000–16,000 ft., *J. D. Hooker s.n.* (holotype, K; isotypes, BM, G, GH, P).

Herbs annual, 2–10 cm tall. Trichomes short stalked and subdendritic or forked, subsessile and submalpighiaceous and dendritic on leaves, stems, pedicels, and fruits, rarely simple along leaf margin. Basal leaves rosulate, smaller than and somewhat similar to cauline ones, drying by flowering time. Stem leaves few to many, often densely grouped below inflorescence; petioles 3–10(–25) mm long, ciliate with simple subsetose trichomes; leaf blades spatulate to oblanceolate, 3–12 × 2–7 mm, base attenuate, margins dentate to pinnatifid with 1 to 4, oblong to linear, 1–5 × 0.5–1 mm, lateral lobes on each side, apex obtuse. Racemes 8- to many flowered, ebracteate or sometimes lowermost pedicels with adnate bracts, not elongated in fruit. Fruiting pedicels divaricate, straight, 1–3.5 cm long. Sepals oblong, 2–3.5 × 1–1.5 mm, spreading, sparsely hairy, persistent. Petals yellow, broadly obovate to spatulate, 3–5.5 × 1.5–4 mm, persistent, apex emarginate to rounded; claws 1–2 mm long. Filaments 2–3 mm long, persistent; median pairs with oblong to obovate wings 0.5–0.9 mm wide, unexpanded portion of filament to 0.6 mm long; lateral pair entire or winged; anthers reniform, 0.3–0.5 mm long. Nectar glands ovate, to 0.2 mm long. Ovules 6 to 14 per locule. Fruit narrowly linear, 1.5–2.5 cm × ca. 1 mm, terete; valves torulose, densely beset with submalpighiaceous sessile trichomes; septum complete; style 0.5–2 mm long; stigma ca. as wide as style, entire. Seeds oblong, 1–1.4 × 0.5–0.6 mm; cotyledons accumbent.

Phenology. Flowering in June and July; fruiting in July and August.

Habitat. Rocky slopes; elevation 4200–4900 m.

Distribution. China and Sikkim.

The material from China has somewhat larger flowers than that of the Sikkim type and perhaps represents an undescribed infraspecific taxon. However, I have examined only a limited collection of the species from its entire range and therefore refrain from recognizing the Chinese material formally.

Although the type of *Lepidostemon pedunculosus* was collected from Sikkim (Hooker & Thomson, 1861), the species was not included in recent floristic works of India (Hajra & Chowdhery, 1993; Srivastava, 1998). The report of the species from Bhutan and the description of flower color as purple (Grierson, 1984) is based on plants herein recognized as *L. gouldii.*

Specimens examined. CHINA. **Xizang (Tibet):** Tremo La, *Gould 2381* (K); Guatoa to Phari via Dotha Valley, *Gould 2132* (K); Choom-la-ru, 30 July 1882, *King s.n.* (BM, K).

2. Lepidostemon gouldii Al-Shehbaz, sp. nov. TYPE: Bhutan. Kemphu, 12,000–16,000 ft., 13 June 1938, *J. Gould 466* (holotype, BM; isotype, BM).

Herba annua. Folia caulina spathulata vel oblanceolata, integra vel 1- vel 2-dentata, pilis simplicibus. Racemi ebracteati, 3- ad 12-flori. Sepala, petala et filamenta caduca. Petala purpurea, lavandula, vel alba, 4.5–6 × 3–4 mm. Filamenta mediana dentata, alata, 1.5–2.5 mm longa; alae 0.3–0.5 mm latae. Siliquae immaturae anguste oblongae, 5–10 mm longae; valvae torulosae, pilis furcatibus et dendroidibus.

Herbs annual, 2–15 cm tall. Trichomes simple, stalked forked (Y-shaped), or subsessile and submalpighiaceous on stems and pedicels, predominantly simple and to 1.5 mm long on leaves. Basal leaves rosulate, smaller than and somewhat similar to cauline ones, drying by flowering time. Stem leaves few to many, well-spaced below the inflorescence; petioles obsolete or rarely to 2 mm long; leaf blades spatulate to oblanceolate, 2–15 × 1–3(–4) mm, sparsely pubescent, base attenuate, margins entire or obscurely dentate with 1 or 2 teeth on each side, apex obtuse. Racemes 3- to 12-flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels divaricate, recurved, 5–12 mm long. Sepals oblong, 1.5–2 × 1–1.5 mm, spreading, caducous. Petals purple to lavender or rarely white, broadly obovate, 4.5–6 × 3–4 mm, caducous, apex emarginate; claws 1–2 mm long. Filaments 1.5–2.5 mm long, caducous; median pairs dentate, with a linear wing 0.3–0.5 mm wide, unexpanded portion of filament to 0.3 mm long; lateral pair entire; anthers reniform, 0.3–0.5 mm long. Nectar glands ovate, 0.2–0.3(–0.4) mm long. Fruit (immature) narrowly oblong, 5–10 × ca. 1 mm, terete; valves torulose, densely pubescent with stalked, forked and dendritic trichomes; style ca. 1 mm long; stigma large, wider than style, entire. Immature seeds oblong.

Phenology. Flowering May to July; fruiting July to August.

Habitat. Sandy soil near streams, moist *Abies* forest; elevation 3600–4900 m.

Distribution. Bhutan and Nepal.

One of the paratypes, *Ludlow & Sherriff 16839* (BM), was cited by Hara (1977) as a paratype of *Draba williamsii* H. Hara. However, plants of this collection have ebracteate racemes and toothed median staminal filaments that support its placement in *Lepidostemon.* By contrast, the type collection and all Nepalese paratypes of *D. williamsii* cited by Hara have toothless filaments and racemes bracteate throughout.

The single collection cited below from Nepal was annotated as *Lepidostemon pedunculosus,* but that species is restricted to China and Sikkim. *Lepidostemon gouldii* is readily distinguished from *L. pedunculosus* by the flower color, leaf and fruit trichomes, curvature of fruiting pedicels, and duration of floral parts (see key).

Paratypes. BHUTAN. Kemphu, *Gould 465* (BM, E), *Gould 467* (BM); Saga La, upper Mangde Chu, *Ludlow & Sherriff 16839* (BM); Upper Bumthang Chu District, Lambrang Chu, *Lyon 10129* (E); Bumthang District, Dhur Chu, *Lyon 10113* (E). NEPAL. Dolpa District: W of Ringmo, *Yoshida 1007* (TI).

3. Lepidostemon everestianus Al-Shehbaz, sp. nov. TYPE: [China. Xizang] Tibet. East Rongbuk Glacier, Mt. Everest, 21,000 ft. [ca. 6400 m], big scree, 26 July 1935, *E. E. Shipton s.n.* (holotype, BM).

Herba perennis, pilis primariis simplicibus. Folia basalia ovata vel oblonga, 2–6 × 1–3 mm, integra. Racemi 6- ad 12-flori, bracteati; bracteae et pedicelli adnati. Sepala, petala, et filamenta persistentia. Petala alba, obovata, ca. 5 × 2.5 mm. Filamenta mediana dentata et alata, ca. 3.5 mm longa; alae ca. 0.5 mm latae. Siliquae oblongolineares, ca. 7 × 1.5 mm, torulosae. Semina ovata, ca. 1.4 mm longa.

Herbs perennial, 3–4 cm tall, pilose, with a slender rhizome-like caudex. Trichomes almost exclusively simple, to 1 mm long, rarely a few forked and dendritic ones present. Basal leaves rosulate, persistent; petioles 0.5–4 mm long; leaf blades ovate to oblong, 2–6 × 1–3 mm, densely pilose, base obtuse, margins entire, apex obtuse. Stem leaves and bracts similar to basal leaves but smaller. Racemes 6- to 12-flowered, bracteate throughout, slightly elongated in fruit; bracts adnate to pedicels. Fruiting pedicels ascending-divaricate, straight, 2–3 mm long. Sepals oblong, ca. 3 × 1 mm, spreading, sparsely hairy, persistent. Petals white, obovate, ca. 5 × 2.5 mm, apex rounded; claws 2–3 mm long. Filaments persistent; median pairs ca. 3.5 mm long, winged and ca. 0.5 mm wide

basally, minutely toothed below middle; lateral pair ca. 3 mm long, slender, wingless; anthers oblong, 0.7–0.9 mm long. Ovules ca. 4 per locule. Fruit oblong-linear, ca. 7 × 1.5 mm, terete; valves torulose, densely pubescent, obscurely veined; septum complete; style ca. 0.7 mm long; stigma minute, entire. Seeds ovate, ca. 1.4 mm long; cotyledons accumbent.

Phenology. Flowering and fruiting in July.
Habitat. Scree; elevation 6400 m.
Distribution. Endemic to China (Xizang).

Lepidostemon everestianus grows at an altitude (ca. 6400 m) that surpasses every other Brassicaceae that I know. Unfortunately, the species is known only from the type gathering, and more collections are needed to have a better understanding of this remarkable species.

Lepidostemon everestianus differs from the rest of the genus in having almost exclusively simple leaf trichomes and fully bracteate inflorescences. However, it is assigned to *Lepidostemon* by its dentate, winged filaments of the median stamens, persistent sepals, petals, and stamens, and toothlike lateral nectaries.

4. **Lepidostemon rosularis** (K. C. Kuan & Z. X. An) Al-Shehbaz, comb. nov. Basionym: *Christolea rosularis* K. C. Kuan & Z. X. An, in C. Y. Wu, Fl. Xizangica 2: 386. 1985. TYPE: China. Xizang: from Ritang to Cona, 4750 m, 21 Aug. 1975, *Qinghai-Xizang Expedition 75–1490* (holotype, PE; isotype, KUN).

Herbs annual, 1–4 cm tall. Trichomes short stalked and subdendritic or forked, simple ones to 1 mm long on petioles and fruits. Basal leaves rosulate, smaller than cauline ones, entire, drying by flowering time. Stem leaves several to many, often densely grouped below inflorescence; petioles 5–14 mm long, ciliate with simple trichomes; leaf blades spatulate to oblanceolate or ovate, 3–10 × 2–6 mm, sparsely pubescent, base cuneate, margins with 1 to 4 teeth on each side, apex obtuse. Racemes 10- to many flowered, ebracteate or rarely lowermost pedicels with adnate bracts, not elongated in fruit. Fruiting pedicels divaricate, straight, 0.5–2 cm long. Sepals oblong, 2–3.5 × 1–1.5 mm, spreading, pubescent, persistent. Petals white, broadly obovate, 3–5 × 2–3 mm, persistent, apex rounded; claws 1–2 mm long. Filaments 2–2.5 mm long, persistent; median pairs narrowly lanceolate, winged, 0.4–0.5 mm wide; lateral pair slender, wingless; anthers reniform, 0.4–0.5 mm long. Ovules 6 to 8 per locule. Fruit oblong-linear, 1–2 cm × 2.5–3 mm, flattened; valves with obscure midvein and prominent marginal veins, somewhat indurate at margin and connate at base, dehiscing basipetally, not torulose, pilose with forked and/or simple trichomes; septum complete; style 0.5–1.5 mm long; stigma subentire to 2-lobed. Seeds ovate, 1.2–1.6 × 0.8–1 mm; cotyledons accumbent.

Phenology. Flowering June and July; fruiting July and August.
Habitat. Stony ground, slopes, dry gullies, scree; elevation 4200–5100 m.
Distribution. Endemic to China.

The type collection (three sheets) of *Lepidostemon rosularis* consists of five plants with mature fruits and a few aborted flowers, while *Kingdon-Ward 11846* consists of eight plants all in flower and some with young fruits. The two collections are basically similar except for the fruit indumentum. Fruits of the type collection are covered exclusively with simple trichomes, whereas those of Kingdon-Ward's collection have simple trichomes on the valve margin and either exclusively forked or a mixture of simple and forked on the rest of the valve.

The holotype of *Lepidostemon rosularis* has some pedicels with small adnate bracts. In this, the species resembles *L. pedunculosus* and *L. everestianus*, though the last has all pedicels with adnate bracts.

In assigning this species to *Christolea*, Kuan (1985) and An (1987) followed Jafri (1955, 1973) who adopted a very broad concept of the genus that included species presently assigned to six genera (Al-Shehbaz, 2000). It is excluded from *Christolea* because it is an annual with a distinct basal rosette, leafless stems, branched trichomes, accumbent cotyledons, obtuse anthers, winged filaments of median stamens, and persistent floral parts. *Christolea* consists of perennials without basal rosettes and with leafy stems, simple trichomes, incumbent cotyledons, apiculate anthers, slender filaments, and deciduous floral parts. Although most species of *Christolea* recognized by Kuan (1985), An (1987), and Jafri (1955, 1973) have been assigned to *Desideria* (Al-Shehbaz, 2000), *Lepidostemon rosularis* clearly differs from those by having a distinct style, fruit valves not adnate apically to the replum, white flowers, persistent floral parts, winged filaments, and pinnately veined leaves. By contrast, species of *Desideria* have obsolete styles, fruit valves adnate apically to the replum, blue or purplish flowers, deciduous floral parts (sometimes sepals persistent), wingless filaments, and palmately veined leaves. Except for its flattened fruits with thickened valve margins, *L. rosularis* is perfectly at home in *Lepidostemon*.

Other material examined. CHINA. **Xizang (Tibet):** Sanga Chöling, *Kingdon-Ward 11846* (BM).

5. Lepidostemon glaricola (H. Hara) Al-Shehbaz, comb. nov. Basionym: *Chrysobraya glaricola* H. Hara, J. Jap. Bot. 49: 195. 1974. TYPE: Bhutan. Above Kuma Thang, Paro Chu Drainage, in moss or scree with running water, 13,000 ft., 14 Oct. 1949, *Ludlow & Sherriff 17477* (holotype, BM).

Herbs caespitose perennials, 1–10 cm tall. Trichomes crisped, dendritic, or rarely forked. Basal leaves rosulate, many; petioles 3–12 mm long; leaf blades spatulate to obovate or oblanceolate, 3–15 × 1.5–5 mm, base attenuate, margins 1- to 4-toothed on each side, rarely subentire, apex subacute to obtuse. Racemes many flowered, ebracteate, elongated in fruit. Fruiting pedicels ascending to divaricate, slender, straight or slightly curved, (0.5–)1–3 cm long. Sepals oblong, 2–2.5 × 1–1.5 mm, slightly spreading, hairy, persistent. Petals bright yellow, broadly obovate, 3–6 × 2–4 mm, persistent, apex emarginate to rounded; claws 1–2 mm long. Filaments 1.5–2.5 mm long, persistent, neither winged nor dentate; anthers reniform, 0.5–0.6 mm long. Nectar glands clavate, 0.5–1 mm long. Ovules 4 to 6 per locule. Fruit linear-oblong, 4–11 × 1.5–2 mm, terete; valves torulose, densely pubescent with dendritic trichomes, obscurely veined; septum complete or perforate; style 0.3–1 mm long; stigma wider than style, entire. Seeds oblong, 1–1.2 × 0.5–0.6 mm; cotyledons incumbent.

Phenology. Flowering May through July; fruiting July to October.

Habitat. On rocks, in mossy boulder scree, wet stream beds, scree with running water, meadows, rock crevices; elevation 4000–4700 m.

Distribution. Bhutan and Nepal.

Lepidostemon glaricola is much more common in Bhutan than in Nepal, and the record from Nepal is based on the single collection below, which was reported by Hara (1974, 1979) under *Chrysobraya.*

Specimens examined: BHUTAN. Saga La, Upper Mangde Chu, *Ludlow, Sherriff & Hicks 16838* (E); Marlung, Tsampa, *Ludlow, Sherriff & Hicks 19376* (E); Kuma Thang, foot of Pangte La, Paro Chu, *Ludlow & Sherriff 16276* (BM, E); Pangte La, Paru Chu, *Ludlow & Sherriff 16290* (BM, E); Lingshi, *Cooper 1654* (E); Dole La, *Cooper 4037* (E); Yelé La Timpu, *Cooper 1851* (E); Upper Mo Chu District, valley below Chhew La, above Chebesa, 27°57′N, 89°29′E, *Sinclair & Long 5444* (E); Yala, Pyala, *Gould 1316* (K). NEPAL. Jalang Chhyongo, *Kanai, Ohashi, K. Iwatsuki, Ohba, Z. Iwatsuki & Shakya 720631* (TI).

Acknowledgments. I am most grateful to Hideaki Ohba (TI), Sue Zmarzty and Gillian Challen (K), Henry Noltie (E), and Roy Vickery (BM) for their help with the loans. I am much indebted to Zhu Guanghua for his help in the translation of Chinese text and herbarium labels. Neil Harriman, Victoria Hollowell, Amy McPherson, and Diana Gunter are thanked for their critical comments on the manuscript. The directors and curators of the herbaria cited in this paper are thanked.

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What is *Nasturtium tibeticum* (Brassicaceae)?

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ABSTRACT. The status of *Nasturtium tibeticum* is discussed, and the new combination *Dontostemon tibeticus* is proposed. Accounts of *N. tibeticum* in some Chinese floras are based on plants of the new species *Phaeonychium fengii*. The distinguishing characters of *Nasturtium*, *Dontostemon*, and *Phaeonychium* are presented.

During the revision of Brassicaceae for the *Flora of China*, it became evident that the identity and generic placement of the poorly known *Nasturtium tibeticum* Maximowicz were erroneously interpreted in several accounts of the family for provincial and national Chinese floras. As shown below, such accounts involve two species more appropriately placed in *Dontostemon* Andrzejowski ex C. A. Meyer and *Phaeonychium* O. E. Schulz. Unfortunately, treatments of these two genera (Al-Shehbaz, 2000; Al-Shehbaz & Ohba, 2000) were already in press when I started working on the *N. tibeticum* problem and, therefore, it was not possible to incorporate the following findings into those two publications.

Although Maximowicz (1889) provided detailed description and illustrations of *Nasturtium tibeticum*, he did not discuss its generic placement and only indicated that it cannot be placed in *Sisymbrium* L. on account of its accumbent instead of incumbent cotyledons. That original disposition of *N. tibeticum* has not been questioned until the present, though Schulz (1933, 1936) recognized its anomalous position in *Nasturtium* R. Brown and placed it in the monotypic section *Ktenokardamum* O. E. Schulz. However, Schulz's broad concept of *Nasturtium* included also all of *Rorippa* Scopoli and a few species presently assigned to other genera.

As delimited by Al-Shehbaz and Price (1998), *Nasturtium* includes five species, of which two are native to North America, two to Europe, and one to North Africa. It consists of aquatic perennials with hollow stems rooting at the submersed lowermost nodes, pinnately compound emergent leaves with nondecurrent lateral leaflets, and coarsely reticulate seeds. *Nasturtium tibeticum* clearly does not belong to this genus because it is a terrestrial biennial with solid stems not rooting at the lowermost nodes, pectinate-pinnatifid leaves with decurrent lateral leaf lobes, and minutely reticulate seeds. In every aspect of the plant, *N. tibeticum* is most at home in *Dontostemon* (including *Dimorphostemon* Kitagawa), an Asian genus of ten species (Al-Shehbaz & Ohba, 2000). The species, hereafter known as *D. tibeticus*, has multicellular glandlike warts on the fruit valve but not the typical glands characteristic of four of the ten species of *Dontostemon*, nor does it have the connate median filaments found in eight of those ten species. However, it has broadly expanded and sometimes minutely denticulate bases of the median staminal filaments, distinctly 2-lobed stigmas, accumbent cotyledons, white flowers with purplish petal claws, and strongly divided leaves. In this, *D. tibeticus* is more similar to *D. pinnatifidus* (Willdenow) Al-Shehbaz & H. Ohba than to other Himalayan or Asian species. From other species of *Dontostemon*, *D. tibeticus* is readily distinguished by having pectinate-pinnatifid leaves, prominently 2-lobed stigmas with subdecurrent lobes, and free, basally flattened bases of the median staminal filaments.

The descriptions and illustrations of *Dontostemon tibeticus* (as *Nasturtium*) in *Flora Qinghaiica* (Huang, 1997) and *Flora Xizangica* (Kuan, 1985) were accurate, but those in other floras (see below) were not. Because of the confusion in the identity of this species, a detailed description and citation of specimens are provided. Excellent illustrations of the species can be found in Maximowicz (1889) and Huang (1997).

Dontostemon tibeticus (Maximowicz) Al-Shehbaz, comb. nov. Basionym: *Nasturtium tibeticum* Maximowicz, Fl. Tangut. 54. 1889. TYPE: China. Tibet: alpine areas at River Bö-Tschü, 25 June–7 July 1884, *N. M. Przewalski s.n.* (lectotype, here designated, LE, photo MO; isotypes, P, PE).

Herbs biennial, (1.5–)4–14(–20) cm tall, pilose with simple trichomes to 1.5 mm, with a somewhat fleshy root. Stems often few from base, simple above. Basal and lowermost stem leaves eglandular; petiole (0.3–)1–2 cm long; leaf blade lanceolate to oblong or oblanceolate in outline, somewhat fleshy, (0.7–)1.2–2.7(–3.5) cm × (3–)5–10(–14) mm, base attenuate to cuneate, margin pectinate-pinnatifid,

apex acute; lateral lobes (4 to) 7 to 11, to 5 × 2.5 mm, decurrent, sometimes imbricate, abaxially toothed or entire, adaxially entire, acute; uppermost stem leaves sessile. Fruiting pedicel divaricate, (2–)3–7(–9) mm long, eglandular, stout. Sepals ovate, 3–4 × 1.5–2 mm, sparsely hairy apically or glabrous, lateral pair slightly saccate. Petals white with pink or purplish claws, obcordate, 5–8 × 2.5–3.5(–4) mm, apex emarginate; claw 3–4 mm long. Filaments of median stamens 3–4 mm long, free, flattened and sometimes minutely toothed on 1 side; filament of lateral stamens 2–2.5 mm long, slender; anthers oblong, 0.7–1 mm long, not apiculate. Ovules 12 to 20 per ovary. Fruit (0.8–)1–1.5(–1.7) cm × (0.8–)1–1.3 mm, straight, torulose, terete; valves with a prominent midvein, with multicellular glandlike warts; style 1–3 mm long; stigma prominently 2-lobed, lobes subdecurrent. Seeds brown, oblong-ovate, 1.4–1.6 × 0.9–1 mm, wingless; cotyledons accumbent. Flowering June–July, fruiting July–August.

Loose scree, disturbed alpine meadows, moist gravelly slopes, permafrost gravel and sandstone, steep rocky slopes; 3200–5200 m. Gansu, Qinghai, Xizang.

Maximowicz (1889) cited three syntypes all mounted on the same sheet at LE. The collection with nearly mature fruits and on which the original illustration was based is taken here as the type. The other two syntypes have rather young racemes and no fruits. The species is restricted to Xizang, Qinghai, and adjacent Gansu. The record from Gansu Province is reported here for the first time. The records of *Dontostemon tibeticus* (as *Nasturtium*) from Sichuan (Guo, 1987; Wang, 1993; Tan et al., 1999) are based on plants of the new species *Phaeonychium fengii.*

Specimens examined. CHINA. **Gansu:** Yong Ngun, Nan Qiau, *Villant 883* (P). **Qinghai:** Chindu Xian, Qingshuihe Xiang, W of road between Madoi and Yushu on road to Zadoi just S of Qingshuihe, 33°45′N, 97°7′E, *Ho, Bartholomew, Watson & Gilbert 1606* (BM, CAS, E, HNWP, MO); 33°45′N, 97°3′E, *Ho, Bartholomew, Watson & Gilbert 1643* (BM, CAS, E, HNWP, MO); Chindu Xian, 33°07′39″N, 97°27′44″E, *Boufford, Lu & Ying 26912* (MO); Madoi Xian, NE of Bayan Har Pass, on road between Madoi and Yushu, 34°11′N, 97°46′E, *Ho, Bartholomew, Watson & Gilbert 1703* (BM, CAS, E, HNWP, MO); Madoi to Yushu, E summit of Bayen Har Pass, 25 July 1996, *Perring s.n.* (E); Kou-kou-nor, 24 Nov. 1938, *Neel s.n.* (P), Madoi Xian, *Wu 668, 1162* (HNWP); Guide Xian, *Huang 3561* (HNWP); Angqin Xian, *Wang 687* (HNWP). **Xizang (Tibet):** Tangula Shan, Taoer Jiu Yakou, 32°33′N, 91°51′E, *Dickoré 4138* (GOET, MO); Bi Qu Wenquan-Yanshiping (Lhasa-Golmud Rd.), 33°31′N, 91°58′E, *Dickoré 4157* (GOET, MO); River Tala Chu, 18 June 1884, *Przewalski s.n.* (LE, PE); mountains between Huang He and Blue River, 10 June 1884, *Przewalski s.n.* (LE).

Phaeonychium fengii Al-Shehbaz, sp. nov. TYPE: China. Yunnan: Pai-shu-ho, by NE Likiang Snow Range, open moist streams, 3 Apr. 1939, *K. M. Feng 654* (holotype, A; isotype, PE).

Herba perennis caespitosa caudice pauciramoso et lignoso; caules, pedicelli fructusque pilis submalpighiaceis obtecti, folia sepalaque pilis simplicibus et submalpighiaceis. Folia basalia rosulata, petiolata, oblonga vel oblanceolata, 3–15 × 1.5–6 mm, grosse dentata vel lyrata. Pedicelli fructiferi divaricato-ascendentes, 5–10 mm longi. Sepala oblonga, 2.5–3.5 × 1–1.5 mm, sparse pilosa, caduca. Petala rosea, obovata, 6–7 × 3.5–4 mm; ungues 1.5–2 mm longi. Ovula 12–16. Fructus immatures teretes, pilosi; stylus ca. 1 mm longus; stigma bilobatum. Semina matura ignota.

Herbs perennial, 3–9 cm tall, caespitose; caudex stout, woody, few branched, to 8 mm diam., covered with petiolar remains of previous years. Trichomes submalpighiaceous on stems, pedicels, and fruits, these mixed with simple ones especially on leaves and sepals. Stems erect, simple from caudex. Basal leaves rosulate; petiole 0.5–1.5 cm long, ciliate with simple trichomes to 1 mm long, becoming papery at base; leaf blade oblong to oblanceolate, 3–15 × 1.5–6 mm, sparsely pilose, base attenuate, margin coarsely dentate and with 3 to 7 teeth on each side, or lyrate, rarely earliest ones subentire, apex subacute. Upper stem leaves similar to basal, subsessile. Racemes corymbose, ebracteate or lowermost 1 or 2 flowers bracteate. Young fruiting pedicel divaricate-ascending, straight, 5–10 mm long. Sepals oblong, 2.5–3.5 × 1–1.5 mm, sparsely pilose, caducous, margin membranous. Petals rose-pink, obovate, 6–7 × 3.5–4 mm, apex rounded; claw 1.5–2 mm long. Filaments slender; median pairs 2.5–3.5 mm long; lateral pair 2–2.5 mm long; anthers oblong, 0.7–0.8 mm long. Ovules 12–16 per ovary. Young fruits terete, pilose; style ca. 1 mm long; stigma 2-lobed. Mature seeds unknown.

Records of *Nasturtium tibeticum* in Guo (1987), Wang (1993), and Tan et al. (1999) are all based on a single misidentified collection, *Feng 654* (PE), of the new species *Phaeonychium fengii.* Plants of this collection are caespitose perennials with woody caudices, slender, toothless, free staminal filaments, confluent median nectar glands, and short-stalked submalpighiaceous trichomes on the stems, pedicels, and young fruits. The species cannot be placed in *Nasturtium* or *Dontostemon,* because these two genera lack branched trichomes and median nectar glands. Furthermore, the lack in *P. fen-*

gii of glandular trichomes and of connate or flattened/toothed median staminal filaments clearly excludes it from *Dontostemon*. All species of *Phaeonychium*, including *P. fengii*, have branched trichomes, woody caudices with petiolar remains of previous years, and confluent median nectar glands (Al-Shehbaz, 2000). Although the type collection of *P. fengii* does not have mature fruits and seeds, its generic placement is best in *Phaeonychium* rather than in any other known genus. However, the coarsely dentate to lyrate leaves in *P. fengii* are somewhat anomalous in the genus because almost all of the other six species of *Phaeonychium* have entire leaves, though *P. albiflorum* (T. Anderson) Jafri sometimes has apically 1- to 3-toothed leaves. *Phaeonychium fengii* is readily distinguished from the other species of the genus by its coarsely dentate to lyrate leaves and submalpighiaceous stalked trichomes that cover the stems, pedicels, and fruits. It is most similar to *P. albiflorum*, which has entire to rarely 1- to 3- toothed leaves and dendritic and forked instead of submalpighiaceous trichomes. The illustrations in Guo (1987) and Tan et al. (1999) of *P. fengii* (as *N. tibeticum*) are representative and should be consulted.

Phaeonychium fengii is known thus far only from the type collection, which consists of 18 plants on two sheets. Wang (1993) cited under *N. tibeticum* another collection, *Sichuan Vegetation Expedition Team 15143*, besides that of the type gathering of *P. fengii*, but I have not seen that collection and therefore I am unable to determine its generic placement.

Acknowledgments. I thank Henk van der Werff for correcting the Latin and Zhu Guanghua for his help in the translation of herbarium labels. I am indebted to the directors and curators of the herbaria cited in this paper.

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The Chinese Endemic *Neomartinella* (Brassicaceae)

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ABSTRACT. The previously monotypic *Neomartinella* is expanded to include two additional species. *Neomartinella grandiflora* is described as new, and the new combination *N. yungshunensis* is proposed. *Neomartinella* is revised, and its relationship to *Eutrema* is discussed.

When Léveillé (1904) proposed the new genus *Martinella*, he was unaware that the name was a later homonym of *Martinella* Cooke & Massee of the Fungi Imperfecti (1889) and of *Martinella* Baillon of the Bignoniaceae (1891). Léveillé (1916) proposed *Esquiroliella* to replace his *Martinella*, but Pilger (1906) had already proposed *Neomartinella* ten years earlier.

Neomartinella was placed by Schulz (1936) in the tribe Arabideae, a tribal disposition that was followed by Lan (1987) and Li et al. (1995). In my opinion, the closest relative of *Neomartinella* is *Eutrema* R. Brown, a genus that Schulz (1924, 1936) placed in the tribe Sisymbrieae. Schulz (1936) depended primarily on the cotyledonary position to separate the Arabideae (cotyledons accumbent) from the Sisymbrieae (cotyledons incumbent), but this tribal distinction is clearly artificial, and both *Eutrema* and *Neomartinella* should be associated with *Cardamine* L., a genus that has been traditionally placed in the Arabideae. In fact, it is sometimes difficult to separate young plants of the three genera, and the characters that separate *Cardamine* from *Neomartinella* are discussed below. From *Eutrema*, *Neomartinella* is readily distinguished by its annual habit, obcordate, apically emarginate petals, accumbent cotyledons, 16 to 40 ovules per ovary, and usually leafless scapes. By contrast, species of *Eutrema* are rhizomatous perennials with oblong-spatulate, apically obtuse petals, incumbent cotyledons, 2 to 10 ovules per ovary, and leafy stems. The two genera resemble each other in having leaves with apiculate callosities that terminate the lateral veins, but in *Neomartinella* the callosities are restricted to the notches between the leaf teeth, whereas in *Eutrema* they occupy the apices of individual leaf teeth. Other similarities include long petiolate basal leaves with palmate venation, nonsaccate sepals, white petals, strongly dilated filament bases, confluent nectar glands, nonapiculate anthers, usually terete and torulose fruits, and wingless uniseriate seeds.

Although He and Lan (1997) proposed the new species *Neomartinella guizhouensis* S. Z. He & Y. C. Lan, this species name is definitely a new synonym of *Eutrema tenue* (Miquel) Makino, extending its range into Guizhou Province, China. *Eutrema tenue* grows in Sichuan, Yunnan, and Tibet (Xizang). As delimited herein, *Neomartinella* consists of three species, of which one, *N. grandiflora*, is described as new, and another, *N. yungshunensis*, is transferred from *Cardamine*. The present revision is based on the examination of all available collections in the major herbaria of China, Europe, and North America.

Neomartinella Pilger, in Engler & Prantl, Nat. Pflanzenfam., Nachtr. 3: 134. 1906. *Martinella* H. Léveillé, Bull. Soc. Bot. France 60: 290. 1904, not *Martinella* Baillon (1891), not *Martinella* Cooke & Massee (1889). *Esquiroliella* H. Léveillé, Mondes Plantes, ser. 2, 18: 31. 1916. TYPE: *Neomartinella violifolia* (H. Léveillé) Pilger.

Herbs annual. Trichomes absent. Stems few to several from basal rosette, simple, leafy or leafless. Basal leaves long petiolate, rosulate, simple, palmately veined, margin crenate-repand or rarely subentire, with distinct apiculate callosities that terminate ultimate veins and occupy marginal notches. Cauline leaves absent or similar to basal. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender, erect to divaricate. Sepals ovate or rarely oblong, spreading, base of inner pair not saccate. Petals white, spreading; blade obcordate, apex emarginate; claw absent. Stamens 6, spreading, subequal in length; filaments strongly dilated at base; anthers ovate, not apiculate at apex. Nectar glands confluent and subtending bases of all stamens; median nectaries present. Ovules 16 to 40 per ovary. Fruit dehiscent siliques, linear to oblong, terete or rarely slightly latiseptate, sessile; valves papery, with an obscure midvein, torulose; replum rounded, visible; septum complete, membranous, translucent, veinless; style absent or distinct and to 1 mm, cylindric or clavate; stigma capitate, entire.

Seeds uniseriate, wingless, oblong to orbicular, slightly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons accumbent.

Three species: endemic to China.

KEY TO THE SPECIES OF *NEOMARTINELLA*

1a. Stems leafy; style clavate . . . . 1. *N. yungshunensis*
1b. Stems leafless; style absent or cylindric.
  2a. Style absent or rarely to 0.2 mm long; sepals 1.5–2 mm long; petals 4–5.5 mm long; ovules 16 to 20 per ovary; fruit oblong-linear to oblong, 5–12 mm long; at least some flowers on solitary pedicels . . . . . 2. *N. violifolia*
  2b. Style cylindric, to 1–1.2 mm long; sepals ca. 3.5 mm long; petals ca. 8 mm long; ovules 30 to 40 per ovary; fruit linear, young ones longer; flowers in racemes . . 3. *N. grandiflora*

1. Neomartinella yungshunensis (W. T. Wang) Al-Shehbaz, comb. nov. Basionym: *Cardamine yungshunensis* W. T. Wang, Keys Vascular Pl. Wuling Mts. 578. 1995. TYPE: China. Hunan: Yungshun, Xiaoxi, 480–520 m, 27 May 1988, *Exped. Wulingshan 271* (holotype, PE).

Herbs 20–41 cm tall, glabrous throughout. Stems erect, simple, leafy, few to several from base. Basal leaves rosulate; petiole 3–11 cm long; leaf blade ovate or broadly so, 2–6 × 1–5 cm, base subcordate to truncate, margin repand, with apiculate callosities to 0.5 mm, apex rounded to obtuse. Middle stem leaves similar to basal but smaller, often subentire. Infructescence a lax raceme, ebracteate. Fruiting pedicels ascending, filiform, 1–2 cm long. Sepals ovate, 1.5–2 × 1–1.2 mm. Petals white, obcordate, 4–5 × 2–2.5 mm. Filaments white, 1.5–2 mm long; anthers ovate, 0.6−0.8 mm long. Ovules (20 to)30 to 40 per ovary. Fruit linear, (0.8–)1.5–3.5 cm × 1–1.5 mm, terete, torulose; valves with an obscure midvein; style clavate, 0.6–1 mm long. Seeds oblong, slightly flattened, 0.8–1.1 × 0.6–0.7 mm. Flowering in April, fruiting in May.

In his original description of *Cardamine yungshunensis*, Wang (1995) indicated that the species is closely related to *C. violifolia* O. E. Schulz. However, he overlooked the fact that the fruits in *C. yungshunensis* are terete and distinctly torulose, the valves do not dehisce explosively nor do they twist upon dehiscence, the replum is narrowly terete, and the floral parts (sepals, petals, and stamens) are spreading, whereas in *Cardamine* the fruits are flattened and not torulose, the valves dehisce explosively and become twisted, the replum is typically flattened or winged, and the floral parts are erect. Therefore, *C. yungshunensis* is perfectly at home in *Neomartinella* and not *Cardamine*. As indicated below, *C. violifolia* is often confused with *Neomartinella violifolia*, but careful examination of the characters above should readily distinguish the two genera.

Specimens examined. CHINA. **Hunan:** Yungshun, Xiaoxi, *Exped. Wulingshan 159* (PE); Yuanling Zian, Qimeijie, *Anonymous 35* (IBSC).

2. Neomartinella violifolia (H. Léveillé) Pilger, in Engler & Prantl, Nat. Pflanzenfam., Nachtr. 3: 134. 1906. *Martinella violifolia* H. Léveillé, Bull. Soc. Bot. France 60: 290. 1904. *Esquiroliella violifolia* (H. Léveillé) H. Léveillé, Mondes Plantes, ser. 2, 18: 31. 1916. TYPE: China. Guizhou (as Kouy-Tchéou): environs de Gan-pin, Parois du Ta-long, Tsin-gay, Mont Kao-tchay, 11 Feb. and 8 Mar. 1898, *Martin & Bodinier 2069* (holotype, E; isotype, P).

Herbs (4–)7–17(–20) cm tall, scapose, glabrous throughout. Stems erect, simple, leafless, few to several from base. Basal leaves rosulate; petiole (1.5–)3–10(–14) cm long; leaf blade cordate to reniform or suborbicular, (0.8–)1.5–4(–5) × (0.6–)1–3.5(–4) cm, base cordate, margin crenate-repand or rarely subentire, with apiculate callosities to 1 mm, apex rounded to obtuse. Cauline leaves absent. Fruiting pedicels suberect to spreading, filiform, (1–)1.5–4(–7) cm long, a few solitary and originating from center of rosette. Sepals ovate, 1.5–2 × 1–1.2 mm. Petals white, obcordate, 4–5.5 × 2–3 mm. Filaments white, 1.5–2 mm long; anthers ovate, 0.4–0.5 mm long. Ovules 16 to 20 per ovary. Fruit oblong-linear to oblong, 5–12 × 1–1.5 mm, slightly compressed, subtorulose; valves with an obscure midvein; style absent or rarely to 0.2 mm long. Seeds suborbicular, slightly flattened, 0.6–0.9 mm diam. Flowering February–April, fruiting March–May.

In the original description of *Martinella violifolia*, Léveillé (1904) cited one collection, *Martin & Bodinier 2069*, that was made on two different dates, 11 February and 8 March 1898. Launer (1965) correctly indicated that the holotype is at E, and this specimen, which has two plants at different stages of fruit maturity, has both collection dates written on the label. It is assumed that the plant with young fruits, which should be selected as the type, was probably collected in March, while the one with only flowers was collected in February.

The habit and leaves of *Neomartinella violifolia* strikingly resemble those of *Cardamine violifolia* and *Eutrema yunnanense*, and the three species can easily be misidentified. In fact, one collection from Sichuan, *Farges s.n.*, is a mixture of all three spe-

cies. Young plants of these species can be separated as follows: *N. violifolia* has the apiculate callosities in the marginal notches (for an accurate illustration, see Ying et al., 1993), whereas both *C. violifolia* and *E. yunnanense* have these callosities at the apices of individual teeth. The last two species have leafy stems, and in *C. violifolia* the stem leaves are compound and minutely auriculate, whereas in *E. yunnanense* the stem leaves are always simple and not auriculate at base.

Neomartinella violifolia is reported herein for the first time from Hubei and Sichuan, and the species was not included in the floristic accounts of these provinces (Kuan, 1986; Tan et al., 1999) or for China (Lan, 1987). One collection number, *Cavalerie 3091*, was used for samples collected from Guizhou in 1910 and Yunnan in 1907.

Specimens examined. CHINA. **Guizhou:** Tsin-gay, Mont Kao-tchay, *Laborde & Bodinier 2069 bis* (P); Gan Chouen, *Cavalerie 3091* (E, MO, P); Gan Pui, *Esquirol 2027* (E, K, P). **Hubei:** Patung, *Henry 5439* (K). **Hunan:** Tianping Shan, *Anonymous 35* (KUN); Yuandao Dong, *Anonymous 111* (KUN). **Sichuan:** Tchen Keou-Tin, *Farges s.n.* (P); Nanchuan Xian, Jinfo Shan, *Tan Da 91* (PE). **Yunnan:** Guanan Xian, Ma-kai, *Wang 87432* (KUN, PE); Yan-tze-dong, *Wang 87565* (IBSC, KUN, PE); Pien-Jiang, *Cavalerie 3091* (B, E, K, P, W).

3. Neomartinella grandiflora Al-Shehbaz, sp. nov. TYPE: China. Hunan: Jiulongan, damp places by stream banks, 600 m, 17 Apr. 1985, *Luo Yibo 2121* (holotype, PE).

Herba scaposa glabra. Folia basalia rosulata, longi-petiolata, late ovata vel suborbiculata, crenato-repanda, callis apiculiformibus in sinubus marginis sitis; folia caulina carentia. Racemi ebracteati; pedicellae fructiferae 1–1.5 cm longae. Sepala ca. 3.5 mm longa. Petala alba, anguste obcordata, ca. 8 × 3 mm. Ovarium 30- ad 40-ovulatum. Fructus immaturi lineari, ca. 2 cm × 1 mm, subtorulosi; stylum 1–1.2 mm longum. Semina ignota.

Herbs ca. 15 cm tall, scapose, glabrous throughout. Stems erect, simple, leafless, few from base. Basal leaves rosulate; petiole 4–12 cm long; leaf blade broadly ovate to suborbicular, 2–6 × 1.5–3.5 cm, base subcordate to subtruncate, margin crenate-repand, with apiculate callosities to 0.5 mm, apex rounded. Cauline leaves absent. Fruiting pedicels suberect to ascending, 1–1.5 cm long, all on raceme. Sepals oblong, ca. 3.5 × 1.5 mm. Petals white, narrowly obcordate, ca. 8 × 3 mm. Filaments white, ca. 3.5 mm long; anthers ovate, ca. 0.6 mm long. Ovules 30 to 40 per ovary. Immature fruit linear, ca. 2 cm × 1 mm, subtorulose; style slender, 1–1.2 mm long. Mature seeds not seen. Flowering in April.

Neomartinella grandiflora is known only from the two collections cited here. It has the largest flowers in the genus, and is readily distinguished from the other two species by the characters in the key above.

Paratype. CHINA. **Sichuan:** Tchen-kéou-tin, *R. P. Fargen s.n.* (P).

Acknowledgments. I am grateful to Zhu Guanghua and Song Hong for their help in translating collection data from Chinese. I am equally indebted to Anthony R. Brach for his help with the literature. I thank the directors and curators of the herbaria cited in this paper.

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Sinosophiopsis (Brassicaceae), a New Genus Endemic to China

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ABSTRACT. The new genus *Sinosophiopsis* (Brassicaceae) is described, and its relationship to *Sophiopsis* is discussed. The new species *Sinosophiopsis bartholomewii* is described, and the new combination *S. heishuiensis* is proposed.

During the revision of Chinese Brassicaceae for the forthcoming volume 8 of the *Flora of China*, two species were initially set aside for future study. As the result of critical comparisons of these two taxa with most of those of the known Eurasian genera, the conclusion reached is it to place them in a new genus, hereafter known as *Sinosophiopsis*.

Sinosophiopsis, which is endemic to China, is most closely related to the central Asian genus *Sophiopsis*. Both genera consist of annuals with incumbent cotyledons, reticulate and mucilaginous seeds, pinnatisect leaves, terete fruits, and branched trichomes. *Sinosophiopsis* is easily distinguished by having white flowers, linear and strongly torulose fruits, angled and longitudinally striate stems, indumentum consisting of simple and forked trichomes, and ovaries (20 to)24- to 40-ovulate. By contrast, *Sophiopsis* has yellow flowers, elliptic, obovate, or narrowly oblong, usually non-torulose fruits, terete stems, indumentum of primarily dendritic trichomes only rarely mixed with simple ones, and ovaries 4- to 12(to 16)-ovulate.

One of the two species assigned herein to *Sinosophiopsis* was previously described by Wang (1987) as *Cardamine heishuiensis*, and that placement was followed by Tan et al. (1999) without further evaluation. Upon a casual examination of the species, it was immediately concluded that it should be excluded from *Cardamine* for two reasons. First, none of the approximately 200 species of this genus has branched trichomes, and second, all species of *Cardamine* have flattened repla, explosively dehiscent fruits, and valves spirally coiled during dehiscence (Al-Shehbaz, 1988). *Sinosophiopsis heishuiensis* has a mixture of simple and forked trichomes, terete repla, non-explosively dehiscent fruits, and valves remaining flat during fruit dehiscence. Full descriptions of both species of *Sinosophiopsis* are provided to facilitate a direct comparison.

Because of the limited number of collections available for both species of *Sinosophiopsis*, little can be said about their overall variability. The two species are readily distinguished from each other by the characters listed in the key below.

Sinosophiopsis Al-Shehbaz, gen. nov. TYPE: *Sinosophiopsis bartholomewii* Al-Shehbaz.

Herba annua, pilosa, trichomatibus simplicibus vel brevistipitatis furcatis. Caulis striatus. Folia caulina petiolata, nonauriculata, pinnatisecta. Racemi multiflori, bracteati vel ebracteati. Sepala oblonga, nonsaccata. Petala alba, spathulata, breviter unguiculata. Ovula (20–)24–40. Fructus lineares, tereti, valde torulosi, stigmatibus integris, septo completo. Semina oblonga, reticulata, uniseriata, mucilaginosa; cotyledones incumbentes.

Annual herbs. Trichomes a mixture of simple and short-stalked forked ones. Stems erect, simple or branched at base and above middle, angled and longitudinally striate at least distally. Basal leaves withered by anthesis. Cauline leaves petiolate, not auriculate at base, pinnatisect. Racemes many flowered, ebracteate or bracteate along proximal half, elongated considerably in fruit. Fruiting pedicels slender ascending to divaricate or reflexed. Sepals oblong, deciduous, ascending, base of inner pair not saccate, margin and apex membranous. Petals white, longer than sepals; blade spatulate, apex obtuse; claw distinct, shorter than sepals. Stamens 6, tetradynamous; filaments wingless, not dilated at base; anthers ovate, not apiculate at apex. Nectar glands confluent and subtending bases of all stamens; median nectaries present. Ovules (20 to)24 to 40 per ovary. Fruit dehiscent siliques, linear, terete, not inflated; replum rounded, visible; septum complete, membranous, translucent, veinless; style distinct, less than 1 mm, slender, cylindric, glabrous; stigma capitate, entire, unappendaged. Seeds uniseriate, wingless or apically winged, oblong, plump; seed coat coarsely reticulate, mucilaginous when wetted; cotyledons incumbent.

Two species: endemic to China (Qinghai, Sichuan, Xizang)

KEY TO THE SPECIES OF *SINOSOPHIOPSIS*

1a. Raceme bracteate at least along proximal half; fruiting pedicels 1–3(–4) mm long; seeds wingless; petals 2–2.5 × 0.7–1 mm . . . . . 1. *S. bartholomewii*

1b. Racemes ebracteate; fruiting pedicels (5–)7–15 mm long; seeds apically winged; petals 4–5 × 1.5–2 mm . . . . . 2. *S. heishuiensis*

1. Sinosophiopsis bartholomewii Al-Shehbaz, sp. nov. TYPE: China. Qinghai: Nangqên Xian, Larong Gou on E side of the Zi Qu, N of Jiangxi Forest Station and SE of Mozhong, 3450 m, 32°9′N, 97°3′E, 29 Aug. 1996, *T. N. Ho, B. Bartholomew, M. Watson & M. G. Gilbert 2621* (holotype, MO; isotypes, BM, CAS, E, GH, HNWP). Figure 1.

Herba annua, (7–)13–55(–65) cm alta, sparse pilosa. Caulis longitudinaliter striatus, pilosus vel glabrescens. Folia caulina mediana pinnatisecta, 1.5–5.5 × 0.5–2.5 cm; 3–5 juga; petiolis 4–13 mm longis, nonauriculatis, segmentis terminalibus lanceolatis, ellipticis, vel oblongis, 0.7–2 cm × 3–7 mm, dentatis. Racemi in dimidio inferiori bracteati. Pedicelli fructiferi 1–3(–4) mm longi. Sepala oblonga, 1–1.3 × 0.4–0.6 mm, nonsaccata. Petala alba, spathulata, 2–2.5 × 0.7–1 mm, breviter unguiculata. Ovula (20–)26–36. Fructus lineares, tereti, (1–)1.5–2.5(–2.8) cm × 0.8–1(–1.2) mm, valde torulosi; stylo 0.1–0.3 mm longo. Semina oblonga, 0.8–1.1 × 0.5–0.6 mm.

Annual herbs, (7–)13–55(–65) cm tall, sparsely pilose with a mixture of simple and short-stalked, 1-forked trichomes to 1 mm long. Stems erect, simple or branched along lower half, longitudinally striate, pilose or glabrescent distally. Basal leaves withered by flowering. Middle cauline leaves pinnatisect, 1.5–5.5 × 0.5–2.5 cm; petiole 4–13 mm long, not auriculate at base; terminal lobe lanceolate, oblong, or elliptic, 0.7–2 cm × 3–7 mm, base decurrent with distal pair of lateral lobes, margin dentate, apex acute to subacuminate; lateral lobes 3 to 5 on each side of midvein, similar to terminal lobe but smaller. Uppermost cauline leaves with axillary flowers, undivided, much smaller than middle leaves, margin entire or denticulate. Raceme bracteate at least along proximal half. Fruiting pedicels ascending to divaricate, 1–3(–4) mm long, straight, slender, glabrous or sparsely pilose. Sepals oblong, 1–1.3 × 0.4–0.6 mm, glabrous or sparsely pilose, not saccate. Petals white, spatulate, 2–2.5 × 0.7–1 mm, base attenuate, apex obtuse; claw shorter than sepals. Median pairs of staminal filaments 1.5–1.8 mm long, lateral pair 1.1–1.3 mm long; anthers ovate, ca. 0.2 mm long. Ovules (20 to)26 to 36 per ovary. Fruit linear, (1–)1.5–2.5(–2.8) cm × 0.8–1(–1.2) mm, terete; valves strongly torulose, glabrous or sparsely puberulent; style 0.1–0.3 mm long. Seeds brown, oblong, 0.8–1.1 × 0.5–0.6 mm, plump, strongly reticulate, wingless.

Phenology. Flowering and fruiting August and September.

Habitat. Slopes with *Picea likiangensis* (Franchet) E. Pritzel forest, among shrubs and under trees, disturbed alpine meadows, slopes and riparian areas along river bottoms; elevations 3450–4100 m.

Distribution. Endemic to China (Qinghai and Xizang).

Sinosophiopsis bartholomewii is named in honor of Bruce Bartholomew (California Academy of Sciences), who organized two expeditions to Qinghai that led to the collection of this novelty, in recognition of more than two decades of devotion to Chinese botany.

Paratypes. CHINA. **Qinghai:** Yushu Xian, Jiangxi Gou, E of Jiangxi Forest Station on E side of the Zi Qu, SE of Mozhong, 3620 m, 32°4′N, 97°2′E, 28 Aug. 1996, *T. N. Ho, B. Bartholomew, M. Watson & M. G. Gilbert 2551* (CAS, HNWP, MO); Nangqên Xian, Xiaolong Gou, W of Nangqên on road to Domba, 4000–4100 m, 32°17′N, 96°16′E, 3 Sep. 1996, *T. N. Ho, B. Bartholomew, M. Watson & M. G. Gilbert 2808* (BM, CAS, E, GH, HNWP, MO); Nangqên Xian, along the Ba Qu towards the Xizang border from Bêca Forest Station, SE of Bêca, 3790 m, 31°53′N, 96°31′E, 8 Sep. 1996, *T. N. Ho, B. Bartholomew, M. Watson & M. G. Gilbert 3000* (BM, CAS, E, GH, HNWP, MO). **Xizang (Tibet):** Changdu, 10 Aug. 1976, *Anonymous s.n.* (KUN).

2. Sinosophiopsis heishuiensis (W. T. Wang) Al-Shehbaz, comb. nov. Basionym: *Cardamine heishuiensis* W. T. Wang, Acta Bot. Yunnan. 9: 15. 1987. TYPE: China. Sichuan: Heishui, Luhwa, 2400 m, 16 July 1957, *Li Xin 73629* (holotype, PE; isotype, IBSC).

Annual herbs 15–45 cm tall, sparsely pilose with a mixture of simple and short-stalked, 1-forked trichomes to 1 mm long. Stems erect, several branched along lower half, longitudinally striate, pilose. Basal leaves withered by flowering. Middle cauline leaves pinnatisect, 1.2–4.5 × 1–2.5 cm; petiole 3–15 mm long, not auriculate at base; terminal lobe lanceolate to elliptic or oblong, 0.3–2 cm × 2–12 mm, base decurrent with distal pair of lateral lobes or base short petiolulate, margin dentate to subentire, apex acute to obtuse; lateral lobes 2 to 4 on each side of midvein, similar to terminal lobe but smaller. Uppermost cauline leaves much smaller and less divided than middle leaves. Raceme ebracteate. Fruiting pedicels divaricate to reflexed, (5–)7–15 mm long, straight, slender, glabrous or sparsely pilose. Sepals oblong, 1.5–2.3 × 0.8–1 mm, glabrous or sparsely pilose, not saccate. Petals white, spatulate, 4–5 × 1.5–2 mm, base attenuate, apex obtuse; claw

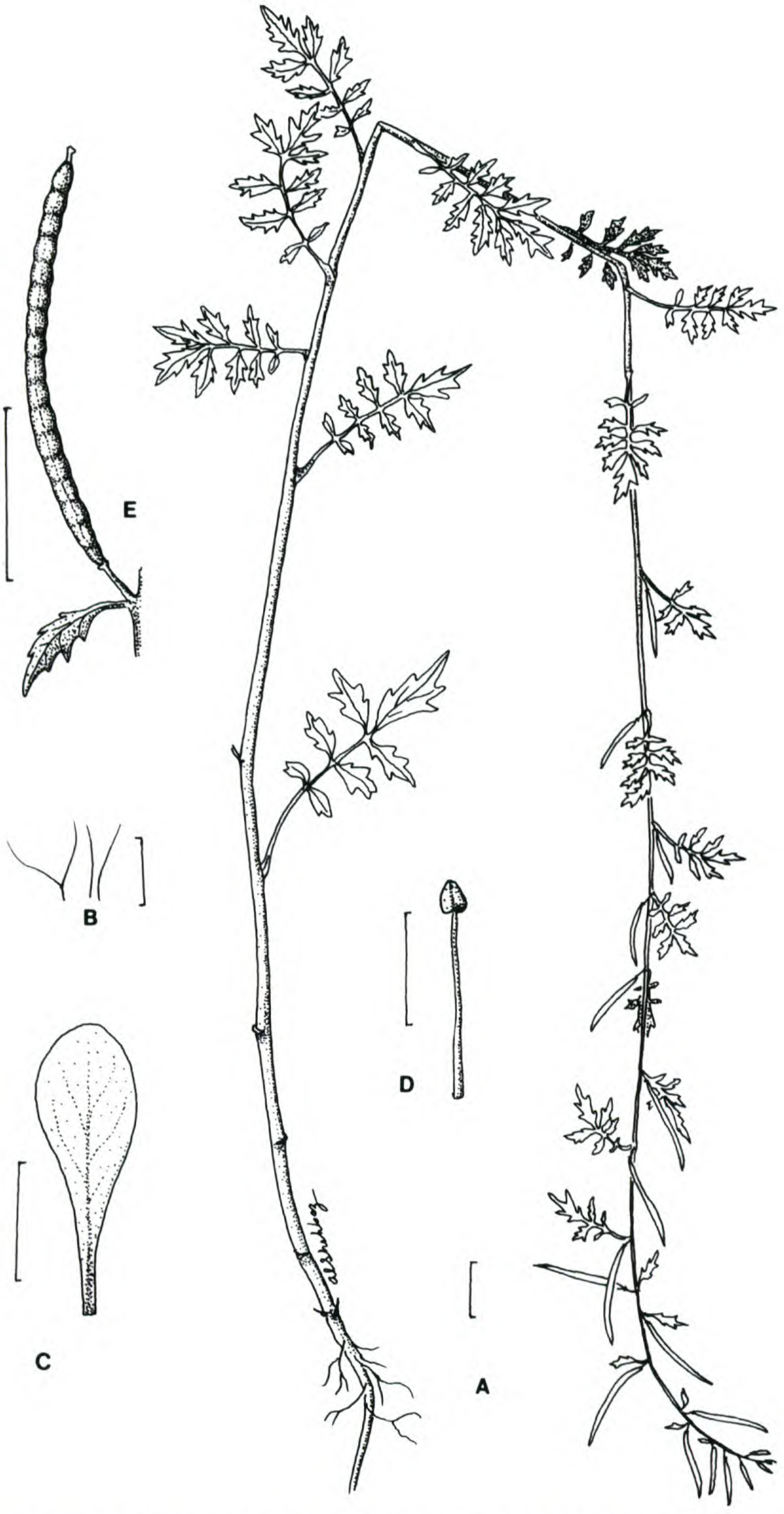

Figure 1. *Sinosophiopsis bartholomewii* Al-Shehbaz. —A. Plant. —B. Stem trichomes. —C. Petal. —D. Median stamen. —E. Fruit, fruiting pedicel, and bract. Drawn by Al-Shehbaz from the holotype (*T. N. Ho et al. 2621*). Scale: A, E = 1 cm; B–D = 1 mm.

shorter than sepals. Median pairs of staminal filaments 2–3 mm long, dilated, lateral pair 1–1.5 mm long; anthers ovate, 0.4–0.5 mm long. Ovules 24 to 40 per ovary. Fruit linear, 1.5–3 cm × 0.7–1 mm, terete; valves strongly torulose, glabrous; style 0.4–1 mm long. Seeds brown, oblong, 1.2–1.4 × 0.6–0.8 mm, plump, strongly reticulate, apically winged.

Phenology. Flowering and fruiting June and August.

Habitat. Rock crevices; elevations 2100–2500 m.

Distribution. Endemic to China (Sichuan).

Additional specimens examined. CHINA. **Sichuan:** Pingwu Xian, Baima, *Wu Zhengyi 832* (KUN); Heishui, Luhua, *Li Xin 73727* (PE).

Acknowledgments. I am profoundly grateful to Bruce Bartholomew for sending his collections of the Brassicaceae from Qinghai (China) for my study. I am indebted to Henk van der Werff for correcting the Latin and to Guanghua Zhu and Song Hong for their help in translating herbarium labels from the Chinese.

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Cochlearia cochlearioides (Brassicaceae) is a *Rorippa*

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ABSTRACT. The Indian endemic *Cochlearia cochlearioides*, initially described as an *Alyssum*, is transferred to *Rorippa*, and the new combination *R. cochlearioides* (Roth) Al-Shehbaz & Jonsell is proposed.

Rorippa cochlearioides (Roth) Al-Shehbaz & Jonsell is endemic to India. It has been known under different names in *Cochlearia* L. and first appeared as *C. flava* in Roxburgh (1814), but that name remained a nomen nudum until it was validated by Hooker (1852). The species was validly published by Roth (1821) as *Alyssum cochlearioides*, a legitimate name that was placed in synonymy of the later published and illegitimate *C. alyssoides* (De Candolle, 1824). *Alyssum cochlearioides* was then transferred to the monotypic *Trochiscus* by Schulz (1933) and to *Cochlearia* by Maheshwari (1957), but it is evident that neither of these generic assignments is appropriate.

Perhaps the main reason that *Rorippa cochlearioides* has been kept for so long in *Cochlearia* is that it has globose, many-seeded fruits. However, such fruits are found in several species of *Rorippa* Scopoli, including the Asian *R. globosa* (Turczaninow ex Fischer & C. A. Meyer) Hayek, the North American *R. calycina* (Engelmann) Rydberg, *R. columbiae* (Suksdorf ex Robinson) Suksdorf ex T. J. Howell, *R. sphaerocarpa* (A. Gray) Britton, and *R. subumbellata* Rollins, and the eastern Asian–North American *R. barbariifolia* (DC.) Kitagawa (Jonsell, 1971, 1973; Rollins, 1993).

Plants of *Rorippa cochlearioides* grow in lowland, tropical and subtropical areas of India and are restricted to the Gujarat and Gangetic Plains (Bhaumik, 1993). The species has pinnatifid, nonfleshy, auriculate cauline leaves, yellow flowers, spreading floral parts, terete fruits, obscurely veined thin valves, and up to 80 reddish, reticulate seeds per fruit. This combination of characters is found in many species of *Rorippa* and does not occur in any species of *Cochlearia*. Species of *Cochlearia* are distributed in the arctic, subarctic, and northern latitudes of the north temperate region, and they have more or less fleshy, entire to dentate nonauriculate leaves, white flowers, erect petals and stamens, somewhat narrowly septate fruits, prominently 1-veined thick valves, and often few to several, often tuberculate seeds per fruit. In fact, all the Himalayan species previously assigned to *Cochlearia* have been or should be transferred to other genera.

It is interesting to note that Schulz (1936) placed *Rorippa cochlearioides* (as *Trochiscus*) in the tribe Drabeae, a tribe that he separated from the Arabideae primarily on the basis of silicles versus siliques, although he indicated that *Nasturtium* R. Brown (including *Rorippa*) is an exception in the Arabideae because it often has silicles. By contrast, Bhaumik (1993) placed the species (as *C. cochlearioides*) in the Lepidieae, where *Cochlearia* has been traditionally placed. In our opinion, neither of these tribal dispositions of *Rorippa cochlearioides* reflects its phylogenetic relationships, and the species should be placed in the same tribe as *Rorippa* and *Nasturtium*. To accommodate the species in *Rorippa*, the following new combination is proposed.

Rorippa cochlearioides (Roth) Al-Shehbaz & Jonsell, comb. nov. Basionym: *Alyssum cochlearioides* Roth, Nov. Pl. Sp. 322. 1821. TYPE: India. *Benjamin Heyne s.n.* (holotype, B-W).

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A Reconsideration of the Genus *Eurycarpus* (Brassicaceae)

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ABSTRACT. The Himalayan (Tibet and adjacent Kashmir) endemic *Eurycarpus* is recognized, and the characters separating its two species from *Christolea, Desideria,* and *Parrya* are discussed. The new combination *E. marinellii* is proposed, and *Christolea longmucoensis* is reduced to synonymy of *E. marinellii.*

In establishing the genus *Eurycarpus,* Botschantsev (1955) separated it from what was then the invalidly published genus *Ermania* Chamisso by the biseriate instead of uniseriate seeds, broadly lanceolate instead of linear fruits, entire instead of dentate leaves, and leafless instead of leafy scapes. However, he probably compared only the type species of both genera because most of these alleged differences do not hold if one compares *Eurycarpus* with the ten species that Botschantsev recognized in *Ermania.* Eight of the ten species of *Ermania* are presently assigned to *Desideria* Pampanini, and the remaining two, including the type of *Ermania,* belong to the earlier published *Melanidion* E. L. Greene. For a discussion on the invalidity of *Ermania* and the generic limits of *Desideria* and *Melanidion,* see Al-Shehbaz (2000).

Although the type species of *Eurycarpus* was originally described in *Parrya* R. Brown, the two genera are unrelated. *Eurycarpus* has at least some of the trichomes forked, nonsaccate lateral sepals, terete replums, wingless seeds, and entire stigmas, and it lacks the multicellular glands. By contrast, *Parrya* has exclusively simple trichomes or the plants are glabrous, strongly saccate lateral sepals, flattened replums, winged seeds, prominently 2-lobed stigmas with decurrent, connivent lobes, and often multicellular glands.

Desideria differs from *Eurycarpus* by having dentate, often palmately veined leaves, prominently veined valves with well-developed marginal veins, linear to linear-lanceolate fruits rectangular in cross section, valve apices persistently united with replum, obsolete styles, and 2-lobed stigmas. *Eurycarpus* has entire, pinnately veined leaves, obscurely veined valves without marginal veins, oblong, elliptic, ovate-oblong, or ovate-lanceolate fruits narrowly elliptic in cross section, valve apices readily free from the replum at dehiscence, well-defined subconical styles, and minute, entire stigmas.

Jafri (1955) adopted a very broad generic concept of *Christolea* that included species presently assigned to six genera (Al-Shehbaz, 2000). He transferred *Parrya lanuginosa* J. D. Hooker & Thomson to *Christolea,* a species that Botschantsev (1955) designated as the type of *Eurycarpus.* Jafri's account was followed rather closely by An (1987) and Kuan (1985). *Eurycarpus* is readily distinguished from *Christolea* by having well-defined rosettes, entire basal leaves, leafless stems, stalked-forked trichomes mixed with simple ones, biseriate seeds, obtuse anthers, basally dilated staminal filaments, slightly elongated infructescences, and obscurely veined valves. *Christolea* lacks the basal leaves and rosettes, and it has dentate leaves, leafy stems, exclusively simple trichomes, uniseriate seeds, apiculate anthers, basally slender staminal filaments, considerably elongated infructescences, and prominently veined valves. In our opinion, these differences are significant, and they clearly support the recognition of *Eurycarpus* as a genus distinct from *Christolea.*

Eurycarpus Botschantsev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 17: 172. 1955. TYPE: *Eurycarpus lanuginosus* (J. D. Hooker & Thomson) Botschantsev.

Herbs perennial, woolly to pilose; caudex slender, few branched. Trichomes simple mixed with stalked 1- to 3-forked ones. Stems erect, simple from rosette. Basal leaves petiolate, rosulate, simple, entire. Stem leaves absent. Racemes several to many flowered, ebracteate, corymbose, elongated slightly in fruit. Fruiting pedicels slender, divaricate. Sepals oblong, deciduous, base of inner pair not saccate, margin membranous. Petals purple; blade spatulate, apex obtuse; claw subequaling se-

pals. Stamens 6, tetradynamous; filaments dilated at base; anthers oblong, not apiculate at apex. Nectar glands 1, confluent and subtending bases of all stamens; median nectaries present. Ovules 8 to 20 per ovary. Fruit dehiscent silicles, oblong, elliptic, ovate-oblong, or ovate-lanceolate, strongly latiseptate, subsessile; valves obscurely veined, glabrous, smooth; replum rounded, visible; septum complete or reduced to a rim, membranous, translucent; style to 0.5 mm long, subconical; stigma capitate, entire, minute. Seeds biseriate, wingless, oblong, plump or slightly flattened; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent or accumbent.

Two species: endemic to China (Tibet) and adjacent Kashmir.

KEY TO THE SPECIES OF *EURYCARPUS*

1a. Leaves lanuginose; fruits oblong-ovate to ovate-lanceolate; septum reduced to a rim; cotyledons accumbent . . . . . 1. *E. lanuginosus*
1b. Leaves pilose; fruits elliptic to oblong, rarely ovate-elliptic; septum complete; cotyledons incumbent . . . . . 2. *E. marinellii*

1. Eurycarpus lanuginosus (J. D. Hooker & Thomson) Botschantsev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 17: 172. 1955. *Parrya lanuginosa* J. D. Hooker & Thomson, J. Linn. Soc., Bot. 5: 136. 1861. *Christolea lanuginosa* (J. D. Hooker & Thomson) Ovczinnikov, Sovetsk. Bot. 1941(1 & 2): 151. 1941. *Ermania lanuginosa* (J. D. Hooker & Thomson) O. E. Schulz, Repert. Sp. Nov. Regni Veg. 28: 185. 1933. *Christolea lanuginosa* (J. D. Hooker & Thomson) Jafri, Notes Roy. Bot. Gard. Edinburgh 22: 52. 1955. TYPE: China. Tibet [Xizang]: Lanjar, 17,500 ft., *R. Strachey & J. E. Winterbottom 7* (holotype, K; isotypes, BM, GH, K).

Draba lanjarica (as *laujarica*) O. E. Schulz, Repert. Sp. Nov. Regni Veg. 33: 109. 1935. TYPE: same as that of *Parrya lanuginosa* (holotype, BM).

Herbs 3–5 cm tall; caudex slender, few branched. Trichomes simple, to 1 mm long, mixed with distinctly stalked 1- to 3-forked ones. Stems densely villous. Basal leaves rosulate, fleshy; petiole 2–7 mm long, persistent, becoming papery; leaf blade suborbicular to spatulate to oblong-obovate, 5–10 × 2–6 mm, sublanate with forked trichomes, base cuneate, margin entire, apex obtuse to rounded. Stem leaves absent. Racemes 8- to 15-flowered, ebracteate. Fruiting pedicels divaricate, straight, 4–7 mm long, densely villous. Sepals obong, 2–2.5 × 1–1.5 mm, pilose. Petals spatulate, ca. 5 × 2.5 mm, apex obtuse; claw ca. 2 mm long. Filaments of median stamens ca. 3 mm long, those of lateral stamens ca. 2 mm long; anthers oblong, ca. 0.6 mm long. Ovules ca. 8 per ovary. Fruit oblong-ovate to ovate-lanceolate, 1.5–2.7 cm × 6–10 mm, strongly flattened; valves glabrous, smooth, with obscure midvein and marginal veins, obtuse at base, acute at apex; septum perforate, reduced to a rim; style subconical, 0.2–0.4 mm long; stigma minute, entire. Seeds biseriate, narrowly oblong, flattened, 2–2.5 × 1–1.3 mm; cotyledons accumbent.

Slopes; 5100–5300 m. China (Xizang).

Schulz (1935) overlooked the fact that his *Draba lanjarica* is based on the same type collection as *Parrya lanuginosa*, a species that he (Schulz, 1933) transferred earlier to the invalidly published *Ermania*. It is interesting to note that Schulz (1936) placed the same species in two genera of two different tribes. He placed *Draba* in the tribe Drabeae and *Ermania* in the tribe Arabideae, and he separated these tribes solely on the basis of having silicles in the Drabeae and siliques in the Arabideae. However, all students of the Brassicaceae readily admit that this distinction in fruit morphology is entirely artificial.

Jafri's (1955) new combination *Christolea lanuginosa* is invalid because it was proposed earlier by Ovczinnikov (1941). Jafri (1973) suggested that *Eurycarpus lanuginosus* (as *Christolea*) is probably conspecific with *C. pumila* (Kurz) Jafri and *Ermania koelzii* O. E. Schulz. That the last two species are conspecific is correct, but as indicated by Al-Shehbaz (2000), they both belong to *Desideria pumila* (Kurz) Al-Shehbaz, a species clearly unrelated to *E. lanuginosus*.

Other specimens examined. CHINA. **Xizang:** Zhada Xian, *Northwest Institute of Biology Xizang Expedition 3916* (HNWP).

2. Eurycarpus marinellii (Pampanini) Al-Shehbaz & G. Yang, comb. nov. Basionym: *Braya marinellii* Pampanini, Bull. Soc. Bot. Ital. 1915: 29. 1915. TYPE: [Kashmir.] Karakorum, 5200 m, 27 June 1914, *G. Danielli & O. Marinelli s.n.* (holotype, FI).

Christolea longmucoensis Y. H. Wu & Z. X. An, Acta Phytotax. Sin. 32: 579. 1994. Syn. nov. TYPE: China. Xizang: Rutog, Longmu Co, 5380 m, 2 Sep. 1987, *Karakorum-Kunlun Expedition 1302* (holotype, HNWP, listed originally as NWBI; isotypes, KUN, PE).

Herbs 3–10 cm tall, pilose; caudex slender, few branched. Trichomes simple, to 1 mm long, mixed with distinctly stalked 1-forked ones. Stems pilose.

Basal leaves rosulate, subfleshy; petiole (1–)3–10(–14) mm long, persistent, becoming papery; leaf blade spatulate to oblanceolate, rarely obovate, (2–)3–12(–15) × (1–)2–8 mm, pilose with simple and forked stalked trichomes, base cuneate, margin entire, apex obtuse to rounded. Stem leaves absent. Racemes (5 to)10- to 22-flowered, ebracteate. Fruiting pedicels divaricate, straight, 4–8(–10) mm long, pilose. Sepals oblong, 2.2–3 × 1–1.5 mm, sparsely pilose. Petals purplish, spatulate, 5–6 × 2–2.5 mm, apex obtuse; claw ca. 2 mm long. Filaments of median stamens 2.5–3.5 mm long, those of lateral stamens 1.5–2.5 mm long; anthers oblong, 0.5–0.6 mm long. Ovules 12 to 20 per ovary. Fruit elliptic to oblong, rarely ovate-elliptic, (0.7–)1–1.7(–2) cm × (4–)5–7 mm, strongly flattened; valves often purplish, glabrous, smooth, with obscure midvein and marginal veins, subacute at both ends; septum complete; style subconical, 0.2–0.5 mm long; stigma minute, entire. Seeds biseriate, narrowly oblong, not flattened, 2–2.5 × 0.8–0.9 mm; cotyledons incumbent.

Alpine areas; 5300–5700 m. China (Xizang), Kashmir.

In his account of *Braya* Sternberg & Hoppe, Schulz (1924) excluded *B. marinellii* Pampanini and did not assign it to another genus. Three years later, he (Schulz, 1927) transferred the species to *Draba* L. It appears that he never examined the type of this species because he (Schulz, 1933) cited two of the collections above, *Pike 832* and *Thorold 34*, as *Ermania lanuginosa*, whereas Jafri (1973) cited them as *Christolea lanuginosa*. Evidently, Schulz and Jafri failed to distinguish *Eurycarpus marinellii* from *E. lanuginosus*. The latter is readily distinguished by having woolly leaves, oblong-ovate to ovate-lanceolate fruits, perforated septum reduced to a rim, and accumbent cotyledons. *Eurycarpus marinellii* has pilose leaves, elliptic to oblong or rarely ovate-elliptic fruits, complete septum, and incumbent cotyledons.

The original description and illustration of *Christolea longmucoensis* (Wu & An, 1994) include several inaccuracies. The leaf trichomes were illustrated and described as stellate and forked. An examination of the type collection and the others cited below reveals that the leaves have simple and once-forked trichomes. The fruit valve was shown to be with a prominent midvein when in fact it is obscurely veined. Although the cotyledons were correctly illustrated as incumbent, they were described as accumbent. Finally, these authors cited only the type collection, which has no flowers. The description of the sepals as 5–6 mm long is also inaccurate. Wu and An (1994) compared *Christolea longmucoensis* with *C. stewartii*, but the latter species belongs to the unrelated *Desideria* (Al-Shehbaz, 2000).

Other specimens examined. CHINA. **Xizang:** Rutog, Guliya, *Li Bosheng & Zheng Du 10975* (PE); Longmucuo Xian, *Qinghai-Xizang Team 13616* (MO, PE); Ritu Xian, Duoma, *Qinghai-Xizang Team 76–9060* (KUN); E of Horpa Tsu, *Pike 832* (K); without locality, *Thorold 34* (K).

Acknowledgments. We are grateful to Zhu Guanghua and Song Hong for their help in the translation of Chinese herbarium labels and to Tatyana Shulkina for help with the Russian literature. We thank the directors and curators of the herbaria cited in this paper.

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A Revision of the Chinese Endemic *Orychophragmus* (Brassicaceae)

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ABSTRACT. *Orychophragmus* consists of two species endemic to China. The new combination *O. limprichtianus* is proposed. *Cardamine hickinii* and *Alliaria grandifolia* are reduced to synonymy of *O. limprichtianus*, and *C. potentillifolia*, *O. diffusus*, and *O. taibaiensis* are reduced to synonymy of *O. violaceus*.

During the revision of the Brassicaceae for the *Flora of China*, it became quite clear that the limits of some of the Chinese species of *Alliaria* Heister ex Fabricius and *Cardamine* L. have been confused, and such taxa are more appropriately placed in *Orychophragmus*. Although *Orychophragmus* is endemic to China, Ying et al. (1993) did not include it in their work of the endemic Chinese genera. Perhaps they were influenced by Schulz (1923, 1936) who recognized two species, *O. violaceus* (L.) O. E. Schulz (China) and *O. winkleri* (Regel) O. E. Schulz (Afghanistan, Tajikistan, Turkmenistan, Uzbekistan), of which the latter was appropriately placed by Botschantsev (1966) and Hedge (1968) in *Spryginia* Popov. The latter differs from *Orychophragmus* by having the median filaments connate throughout, flattened fruits, and incumbent cotyledons. By contrast, *Orychophragmus* has all filaments free, terete or slightly 4-angled fruits, and conduplicate cotyledons.

As herein delimited, *Orychophragmus* consists of two species. One of these, *O. violaceus*, is highly variable, and several of its segregates have been recognized as distinct species. The second species, *O. limprichtianus*, was previously described as *Cardamine* or *Alliaria*, but as shown below, it belongs to *Orychophragmus* because it has conduplicate cotyledons, a feature characteristic of the tribe Brassiceae and not known in any other native Chinese species of the Brassicaceae. *Orychophragmus* was excluded by Gómez-Campo (1980) from the Brassiceae because (p. 5) it has "somewhat conduplicate cotyledons." However, we have examined the cotyledonary position in both species of the genus and found them to be typically conduplicate, as in the vast majority of the tribe. Recent studies by Anderson and Warwick (1999), using two phylogenetically informative isozyme duplications, supported the inclusion of *Orychophragmus* in the tribe Brassiceae. The Brassiceae are a monophyletic tribe readily distinguished from the rest of the Brassicaceae by having conduplicate cotyledons and/or transversely segmented (heteroarthrocarpous) fruits (Al-Shehbaz, 1985), though such fruits are lacking in *Orychophragmus*.

Although *Orychophragmus violaceus* differs substantially from *O. limprichtianus* in flower size (see key) and in having auriculate instead of non-auriculate cauline leaves, the two species belong to the same genus because they have similar basal leaf morphology (e.g., not rosulate, long petiolate, with leafletlike lateral lobes, base often cordate, margin coarsely crenate with teeth ending in apiculae), pilose indumentum of simple trichomes, saccate lateral sepals, apiculate anthers, decurrent 2-lobed stigmas, oblong and alveolate-reticulate seeds, and conduplicate cotyledons. The differences in flower size and color probably are adaptations to different pollinators.

Perhaps one of the most interesting things is that *Orychophragmus limprichtianus* was treated as two species, one each placed in *Cardamine* of the tribe Arabideae and *Alliaria* of the Sisymbrieae (An, 1987; Cheo, 1987; Zhang, 1993). However, the appropriate generic placement of this species in *Orychophragmus* and the affiliation of the genus to the tribe Brassiceae were overlooked because these authors did not examine the cotyledonary position. In light of these findings, the genus *Orychophragmus* is revised, and detailed descriptions are provided for it and its two species.

Orychophragmus Bunge, Mém. Acad. Sci. Saint Pétersbourg 2: 81. 1835. TYPE: *Orychophragmus violaceus* (L.) O. E. Schulz.

Herbs annual, biennial, or rhizomatous perennial. Trichomes absent or simple. Stems erect to

ascending. Basal leaves petiolate, not rosulate, simple or pinnatisect and with 1 to 6 leaflet-like lateral lobes on each side. Cauline leaves petiolate or sessile, not auriculate or auriculate to amplexicaul at base, entire, dentate, crenate, or serrate, sometimes with 1 to 4 lateral lobes. Racemes ebracteate, elongated in fruit. Fruiting pedicels slender or stout, divaricate to recurved. Sepals oblong or linear, erect or ascending, base of inner pair slightly to strongly saccate, margin membranous. Petals purple, lavender, or white; blade obovate to narrowly obcordate, apex rounded or emarginate; claw obscurely to strongly differentiated from blade, shorter than to as long as sepals. Stamens 6, tetradynamous; filaments dilated at base; anthers oblong or linear, apiculate at apex. Nectar glands 2; median nectaries absent; lateral nectaries semiannular or annular. Ovules 20 to 70 per ovary. Fruit dehiscent siliques, linear, terete or somewhat 4-angled, sessile or short stipitate, unsegmented; valves leathery, with an obscure or prominent midvein, glabrous or rarely hairy, smooth or torulose; replum rounded, visible; septum complete, membranous, opaque, veinless; style distinct; stigma capitate, 2-lobed, lobes free, decurrent. Seeds uniseriate, wingless, oblong, plump; seed coat alveolate-reticulate, not mucilaginous when wetted; cotyledons conduplicate.

Two species: endemic to China.

KEY TO THE SPECIES OF *ORYCHOPHRAGMUS*

1a. Cauline leaves auriculate to amplexicaul; sepals linear, erect, (6–)8–13(–16) mm long, base of lateral pair strongly saccate; petals deep purple to lavender or rarely white, (12–)16–25(–32) mm long, apex rounded, claw well differentiated and as long as sepals; anthers linear, (3–)4–6(–8) mm long; style (3–)7–30(–55) mm long . . . . . 1. *O. violaceus*

1b. Cauline leaves not auriculate; sepals oblong, ascending, 2–3.5 mm long, base of lateral pair slightly saccate; petals white, (6–)7–9 × 3–6 mm, apex shallowly emarginate, claw obscurely differentiated and shorter than sepals; anthers oblong, 1–1.5 mm long; style 1–3 mm long . . . . . 2. *O. limprichtianus*

1. Orychophragmus violaceus (L.) O. E. Schulz, Bot. Jahrb. Syst. 54 (Beibl. 119): 56. 1916. *Brassica violacea* L., Sp. Pl. 2: 667. 1753. TYPE: China (holotype, LINN not seen).

Cardamine potentillifolia H. Léveillé, Mem. Real Acad. Cienc. Art. Barcelona 12: 548. 1916. Syn. nov. TYPE: China. Jiangsu, Ton-Zouo-Ze, 12 Mar. 1863, *d'Argy s.n.* (holotype, E).

Orychophragmus diffusus Z. M. Tan & J. M. Xu, Acta Phytotax. Sin. 36: 547. 1998. Syn. nov. TYPE: China. Zhejiang: Yuhang, 300 m, 1 June 1995, *Z. M. Tan et al. 95–16* (holotype, SZ).

Orychophragmus taibaiensis Z. M. Tan & B. Z. Zhao, Acta Phytotax. Sin. 36: 544. 1998. Syn. nov. TYPE: China. Shaanxi: Meixian, Mt. Taibai, 1150 m, 2 July 1995, *Z. M. Tan & B. X. Zhao 95–54* (holotype, SZ).

Herbs annual or biennial, (6–)15–60(–90) cm tall. Stems erect, simple or branched at base, often branched above, straight, glabrous or sparsely to densely pilose. Basal leaves not rosulate; petiole (1–)2–8(–11) cm long; blade or terminal leaf lobe cordate, reniform, broadly ovate, or suborbicular, (0.4–)1.5–10(–14) × (0.3–)1–4(–7) cm, glabrous or pilose, base cordate or rarely obtuse, margin coarsely crenate with teeth ending in apiculae, apex acute to obtuse; lateral lobes 1 to 6 on each side, sessile or petiolulate, to 3 × 2 cm, sometimes absent. Uppermost stem leaves auriculate to amplexicaul, sessile or petiolate, (0.5–)2–9(–15) × (0.2–)1–6(–9) cm, margin coarsely and irregularly dentate, rarely entire, apex acute to acuminate; auricles to 3 × 4 cm; lateral lobes absent or 1 to 4 on each side, sessile or petiolulate. Fruiting pedicels divaricate, glabrous or pilose, narrower than fruit, (0.6–)0.8–2(–3) cm long. Sepals linear, erect, connivent, (0.6–)0.8–1.3(–1.6) cm × 1.5–2.5 mm, base of lateral pair strongly saccate. Petals deep purple to lavender or rarely white, broadly obovate, (1.2–)1.6–2.5(–3.2) cm × (4–)5–9(–11) mm, apex rounded; claw as long as sepals. Filaments white to purple, erect, 0.8–1.8 cm long; anthers linear, (3–)4–6(–8) mm long, distinctly apiculate. Ovules (20 to)40 to 70 per ovary. Fruits narrowly linear, stout, terete or somewhat 4-angled, (3–)4.5–11(–13) cm × 1.5–3 mm; valves glabrous or densely hirsute, torulose, usually with a prominent midvein; style (0.3–)0.7–3(–5.5) cm long; stigma slightly to distinctly 2-lobed and with decurrent lobes. Seeds oblong, 2–3(–3.5) × 1–2 mm; cotyledons conduplicate. $2n = 24$.

Phenology. Flowering March through June; fruiting May through July.

Habitats. Roadsides, gardens, forests, fields, thickets, valleys, hillsides; near sea level to 1300 m.

Distribution. Endemic to China and distributed in the provinces of Anhui, Gansu, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, and Zhejiang. Naturalized in Japan.

Orychophragmus violaceus is probably one of the most variable Chinese species of Brassicaceae. The variation is most dramatic in leaf morphology, especially in leaf size and margin, number of lateral lobes of cauline leaves, and size of auricles. Some authors (e.g., Tan et al., 1998) recognized three additional species, while others (e.g., Schulz, 1923)

recognized one species with five varieties. In some collections (e.g., *Henry 3411*) all the leaves are simple, whereas in others (e.g., the three type collections of *O. violaceus* var. *homaeophyllus* (Hance) O. E. Schulz, var. *hupehensis* (Pampanini) O. E. Schulz, *Cardamine potentillifolia*) all leaves have lateral, leaflet-like lobes. Other collections of the species fall between these two leaf morphs. The type of *O. taibaiensis* has uppermost leaves with minute auricles and no lateral lobes, and in *Wu 92–855* (MO) the lateral flowering branches have petiolate leaves without any auricles. In conclusion, these segregates of *O. violaceus* represent only a small fraction of the overall variability of the species, and we hope that the taxonomy of the species will not be confused any further by according formal recognition to additional variants.

Orychophragmus violaceus is also quite variable in flower size and fruit and style length. The shortest styles (ca. 3 mm) were observed in *Henry 1998* (GH, US) and the longest (ca. 55 mm) were in *Boufford et al. 26131* (MO). Such long styles are among the longest observed in the entire Brassicaceae, reaching to 3(5.5) cm (Al-Shehbaz, pers. obs.). The fruit length depends on the original number of ovules per locule and the number maturing into seeds. The shortest fruits (ca. 3 cm long) were observed in *Togashi s.n.* (A), the longest (ca. 13 cm) in *Deng 11005* (MO). Finally, the smallest flowers (ca. 1.2 cm long) were observed in the type of *Cardamine potentillifolia* and *Hangzhou Bot. Gard. 884* (MO). The largest (ca. 3.2 cm long) were found in *Farges 1330* (GH, P, US), *Wilson 220* (A, NY), and *Feng 51* (GH). The variation in these characters, however, is continuous between the extremes, and one often finds a wide range of forms within a single collection. Furthermore, the variation does not seem to follow any geographical lines. As a result of examining several hundred specimens, we prefer to recognize a highly variable species without any infraspecific taxa.

Forms with pubescent fruits, which occur sporadically throughout most of the species range, were recognized as *Orychophragmus violaceus* var. *lasiocarpus* Migo. However, these often occur mixed with glabrous forms in the same population, as evidenced from *Wang 96001* and *Wang 96068* (both at MO), which were collected in one area.

The measurements of every part of the plant given by Tan et al. (1998) for *Orychophragmus taibaiensis* and *O. diffusus* fall exactly within the general range of variation of typical plants of *O. violaceus*, and therefore the first two are reduced to synonymy of the last. These authors were mistaken in designating a neotype for their new combination *O. hupehensis*, and it seems that they overlooked the fact that Pampanini (1910) cited under his *O. sonchifolius* var. *hupehensis* a single collection (*Silvestri 803*), which is the holotype that we had on loan from FI.

Hector Léveillé (see Launer, 1965) described a few variants of this species as *Arabis* L., *Cardamine* L., and *Raphanus* L., but failed in all cases to discover that he was dealing with one polymorphic species. Launer (1965) was correct in reducing Léveillé's *Arabis chanetii* to synonymy of *Orychophragmus violaceus*. He was also correct in excluding *Cardamine potentillifolia* from *Cardamine*, but he failed to associate the species with *O. violaceus*.

Because of its rich seed oil contents, attempts are made to domesticate *Orychophragmus violaceus* as a crop plant (Peng et al., 1995; Huang et al., 1999). The species is also grown as an ornamental plant and sometimes escapes from cultivation and becomes naturalized.

Representative specimens examined (the holdings of the species in the major Chinese, American, and European herbaria are enormous, and only the specimens representing some of the morphological extremes are cited). CHINA. **Anhui:** Shucheng Xian, *Deng 11005* (MO). **Henan:** Neixiang Xian, Baotianman Nature Reserve, Yinghu Guo, 33°22′N, 111°53′E, *Boufford, Liu, Ying, Zhang & Zhu 26131* (A, E, GH). **Hubei:** Nanto, *Wilson 220* (A, NY); without locality, *Henry 1998* (GH, US), *Henry 3411* (GH, US). **Jiangsu:** Nanjing Botanical Garden, *Wang 96001, 96068* (MO); Soochow, *Feng 51* (GH). **Shaanxi:** Taibaishan, *Wu 92–855* (MO). **Sichuan:** Tchen-keou-tin, *Farges 1130* (GH, P, US). **Zhejiang:** Yuhang Xiang, *Hangzhou Bot. Garden Team 884* (MO). JAPAN (naturalized): Tokyo, Sibguya-ku, Jingumae, 18 May 1971, *Togashi s.n.* (A).

2. Orychophragmus limprichtianus (Pax) Al-Shehbaz & G. Yang, comb. nov. Basionym: *Cardamine limprichtiana* Pax, Jahresber. Schles. Ges. Vaterl. Cutl. 89, Abt. 2: 27. 1911. TYPE: China. Zhejiang: Ningpo, 500 m, 18 Apr. 1911, *W. Limpricht 18* (holotype, WRSL).

Cardamine hickinii O. E. Schulz, Repert. Spec. Nov. Regni Veg. 17: 289. 1921. Syn. nov. TYPE: China. Zhejiang: Hangchou, *H. J. Hickin s.n.* (holotype, K; fragments, B).

Alliaria grandifolia Z. X. An, Acta Phytotax. Sin. 23: 396. 1985. Syn. nov. TYPE: China. Zhejiang: Changhua, Yunxiwu, 2 June 1957, *He Xianyu 23442* (holotype, NAS, as JSBI).

Herbs annual or perennial, (12–)25–45(–80) cm tall. Stems erect, simple at base, often branched above, somewhat flexuous, glabrous or sparsely to densely pilose with trichomes to 1.5 mm long. Basal leaves not rosulate, simple or with 1 to 3 lateral lobes on each side; petiole (3–)5–15(–18) cm long,

flattened at base; blade or terminal leaf lobe cordate to broadly so, (2–)4–8(–10) × (1.5–)2.5–6(–8) cm, glabrous or sparsely to densely subappressed pilose abaxially, glabrous or sparsely pilose adaxially, sometimes ciliate, base cordate or rarely cordate-truncate, margin coarsely crenate with teeth ending in apiculae, apex acute to acuminate; lateral lobes sessile or petiolulate, 0.1–3 × 0.03–2 cm, sometimes absent. Uppermost stem leaves petiolate, much smaller to much larger than basal ones and up to 18 × 11 cm, base not auriculate, margin coarsely and irregularly dentate, rarely crenate, apex caudate to acuminate. Fruiting pedicels divaricate to recurved, glabrous or pilose, narrower than fruit, (0.5–)1–3(–3.5) cm long. Sepals oblong, ascending, 2–3.5 × 1–1.5 mm, base slightly saccate. Petals white, broadly obovate to narrowly obcordate, (6–)7–9 × 3–6 mm, apex shallowly emarginate; claw obscurely differentiated, shorter than sepals. Filaments white, erect, 2.5–3.5 mm long; anthers oblong, 1–1.5 mm long, minutely apiculate. Ovules 20 to 35 per ovary. Fruits narrowly linear, stout, terete, (2–)3–6 cm × 1.5–2 mm; valves glabrous or sparsely pilose, strongly torulose, inconspicuously veined; style terete, 1–3 mm long; stigma 2-lobed, slightly decurrent. Seeds oblong, 2–3 × 0.8–1.2 mm; cotyledons conduplicate.

Phenology. Flowering March through May; fruiting April through June.

Habitats. Grassy areas along streams, moist slopes, roadsides, rocky slopes; 300–1200 m.

Distribution. Endemic to China in the provinces of Anhui and Zhejiang.

The type collections of *Cardamine limprichtiana* and *C. hickinii* have no mature fruits, and one suspects that Pax (1911) and Schulz (1921) assigned their species to *Cardamine* because the basal leaves have lateral, leaflet-like lobes, a feature quite common in *Cardamine* (Schulz, 1903), though it is also found in *Rorippa* and *Nasturtium* R. Brown (Al-Shehbaz & Price, 1998), *Yinshania* Y. C. Ma & Y. Z. Zhao (Al-Shehbaz et al., 1998), and *Orychophragmus* (Schulz, 1923). However, the two species do not belong to *Cardamine* because their replum is terete and the fruit valves are curved and strongly torulose, features that are found in *Orychophragmus*. *Cardamine* has flattened fruits with straight and non-torulose (smooth) valves. It also differs from *Orychophragmus* by having accumbent instead of conduplicate cotyledons.

Although the type of *Alliaria grandifolia* has mature seeds with conduplicate cotyledons, An (1985) did not mention anything about this cotyledonary position. Had he observed the cotyledons, it is very likely that he would have assigned the species to *Orychophragmus* instead of *Alliaria*. *Alliaria* consists of two species, of which *A. petiolata* (Bieberstein) Cavara & Grande is a European and Southwest Asian weed now naturalized worldwide, and *A. brachycarpa* Bieberstein is endemic to the Caucasus (Al-Shehbaz, 1988). *Alliaria* is readily separated from *Orychophragmus* by having longitudinally striate seeds with incumbent cotyledons instead of minutely reticulate seeds with conduplicate cotyledons. The two genera superficially resemble each other in having cordate, dentate or crenate basal leaves, petiolate cauline leaves, elongated fruits, and white flowers.

Orychophragmus limprichtianus is highly variable in the density of leaf indumentum, the size of uppermost leaves, and the number of lateral lobes on the basal leaves. Glabrous or very sparsely pilose forms with large uppermost leaves and rudimentary or no lateral lobes on basal leaves were described as *Alliaria grandifolia*, whereas moderately to densely pilose forms with smaller uppermost leaves and one to three pairs of lateral leaf lobes were recognized as *Cardamine limprichtiana* and *C. hickinii*. There are transitional forms between the two extremes in each of these three characters. In every other aspect of the plant, including flower size, margin of basal leaves, fruit and seed size and shape, length and orientation of fruiting pedicels, cotyledonary type, nature of the fruit valve (inconspicuously veined, torulose) and replum (terete), and flexuous stems, *A. grandifolia*, *C. limprichtiana*, and *C. hickinii* are indistinguishable. Therefore, we consider them as conspecific.

Specimens examined. CHINA. **Anhui:** San Yang, *Anhui Team 1665* (PE); Ji Xi, *Deng 90030* (NAS); Qi Yun Shan, *Shao Jiangzhang 82111* (PE); without locality, *Deng 115* (NAS); Xian Sanyan, *Dong 52* (MO). **Zhejiang:** Chun An, *Hong 841* (MO), *Hong 904* (MO); Hangzhou, *Hangzhou Botanical Garden Team 923* (MO), *Zhang Shaorao 2369* (PE), *He Xianyu 174* (IBSC); Ling Yinsze, *Merrill 2891* (K); Chang Hua, *Chiu 570* (MO), *Hangzhou Botanical Garden Team 433* (MO), *Anonymous 28598* (PE), *He Xianyu 22948* (IBSC, PE); Xian Ju, *Chang 7955* (MO); Tong Lu, *Hong 1976* (MO); Fei Lai Shan, *Chang 1869* (MO); without locality, *Barchet 36* (US); An Ji, *Deng 90143* (MO); His-Tienmu Shan, 23 Apr. 1936, *Migo s.n.* (NAS).

Acknowledgments. We thank Zhu Guanghua, Song Hong, and Bao Bojian for their help in translating collection data from Chinese, and Anthony R. Brach for his help with the literature. We are grateful to Suzanne I. Warwick for her critical review of the manuscript. We thank the directors and curators of the herbaria cited in this paper.

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Baynesia, a New Genus of Stapeliad from the Northwestern-most Corner of Namibia (Apocynaceae)

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ABSTRACT. A new genus of stapeliad, *Baynesia* (Apocynaceae–Asclepiadoideae–Ceropegieae), is described with a single species, *B. lophophora* Bruyns. This is known from the mountainous area in the northwestern-most corner of Namibia, where it was relatively plentiful but very local. Its relationships to *Caralluma* R. Brown and *Pseudolithos* P. R. O. Bally are discussed.

At present the group of highly succulent plants known as the stapeliads is considered to form a monophyletic group within the Ceropegieae, and it consists of 25 genera (Bruyns, 2000). The present new species does not fit comfortably into any of these genera, and consequently it is placed in a new genus, *Baynesia*. Its closest relationships appear to lie with *Caralluma* and *Pseudolithos;* the differences between them are discussed in detail.

Baynesia Bruyns, gen. nov. TYPE: *Baynesia lophophora* Bruyns, sp. nov.

A *Caralluma* caulis rugulosis et papillatis differt; a *Pseudolithos* pagina caulium sine polygonis elevatis, praesentia interdum denticulorum stipularium et pollinario multum dissimili distinguenda est.

Dwarf spineless clump-forming succulent 30–80(–150) mm diam. *Stems* erect, not rhizomatous, fleshy and fairly soft, glabrous, somewhat transversally rugulose and finely papillate, 30–80 × 6–12 mm, green to suffused with brown; *tubercles* obscurely conical, slightly spreading, fused into 4 obtuse and obscure angles along stem with concave area between them; *leaf-rudiment* spreading, caducous, cordate-acute, 1.0–1.5 mm long, inserted just below base of next tubercle, with very occasional stipular denticles. *Inflorescences* glabrous, usually 3–10 per stem, arising toward apex, each bearing 1–3(–5) flowers developing in gradual succession, without peduncle, with minute linear bracts < 1 mm long without lateral teeth; *pedicel* 1.5–2.5 × < 1.0 mm, descending and holding flower facing partly downward, usually somewhat longitudinally ridged, suffused with red; *sepals* lanceolate, acuminate, ca. 1.5 × 0.5 mm. *Corolla* campanulate, 3–4 × 6–8 mm; outside smooth and glabrous, pale green suffused with red; inside deep maroon becoming cream in lower half of tube, glabrous, papillate only in two lines along edges of fold in lobes (± around mouth of tube); *tube* ± hemispherical, ca. 1.5 × 3–4 mm; *lobes* erect, ca. 2 × 2 mm, ovate-acute, folded along midrib so that inside crested toward apex, apex recurved, without marginal cilia. *Corona* ca. 1 × 2 mm, consisting of 2 series of lobes arising from staminal tube and close together on it, glabrous, with very short basal stipe; *outer lobes* deltoid, acute, ca. 0.5 mm long and broad, spreading, dark maroon in patch beneath guide-rail, otherwise transparent; *inner lobes* adpressed to backs of anthers and mostly equaling them, dorsiventrally flattened and slightly convex above, obtuse, ca. 0.5 mm long, with obtuse swollen dorsal projection between outer lobes, cream. *Anthers* horizontal on top of style-head, margins shrinking back to expose pollinia, rectangular. *Pollinium* ellipsoidal, much broader than long, insertion crest exactly along outer edge, caudicle minute. *Follicle* 25–35 × 2.5–3.5 mm, glabrous, smooth, faintly streaked with brown on cream-green. *Seeds* 5 × 1.5–2.0 mm, uniformly pale brown, with margins folded upward.

Baynesia lophophora Bruyns, sp. nov. TYPE: Namibia. Kaokoveld, Baynes Mtns. near the Cunene River, Dec. 1999, *P. V. Bruyns 8000* (holotype, BOL; isotypes, K, MO, PRE, WIND). Figures 1, 2.

Species unica, a speciebus *Caralluma* lobis corollae porcatis cristatisque et pollinario polliniis insolenter latis corpusculoque alis lateralis minutis differt.

Distribution and habitat. This new species is, at present, known only from the north-facing aspects of the higher parts of the Baynes Mountains overlooking the Cunene River in the northwestern corner of Namibia. Here it occurs at an altitude of 1500–1600 m just above the large, sandstone cliffs that dominate the landscape in this area.

The vegetation of these cliffs is quite different from that of the surroundings and consists mainly of succulents. Species such as *Aloe corallina* Ver-

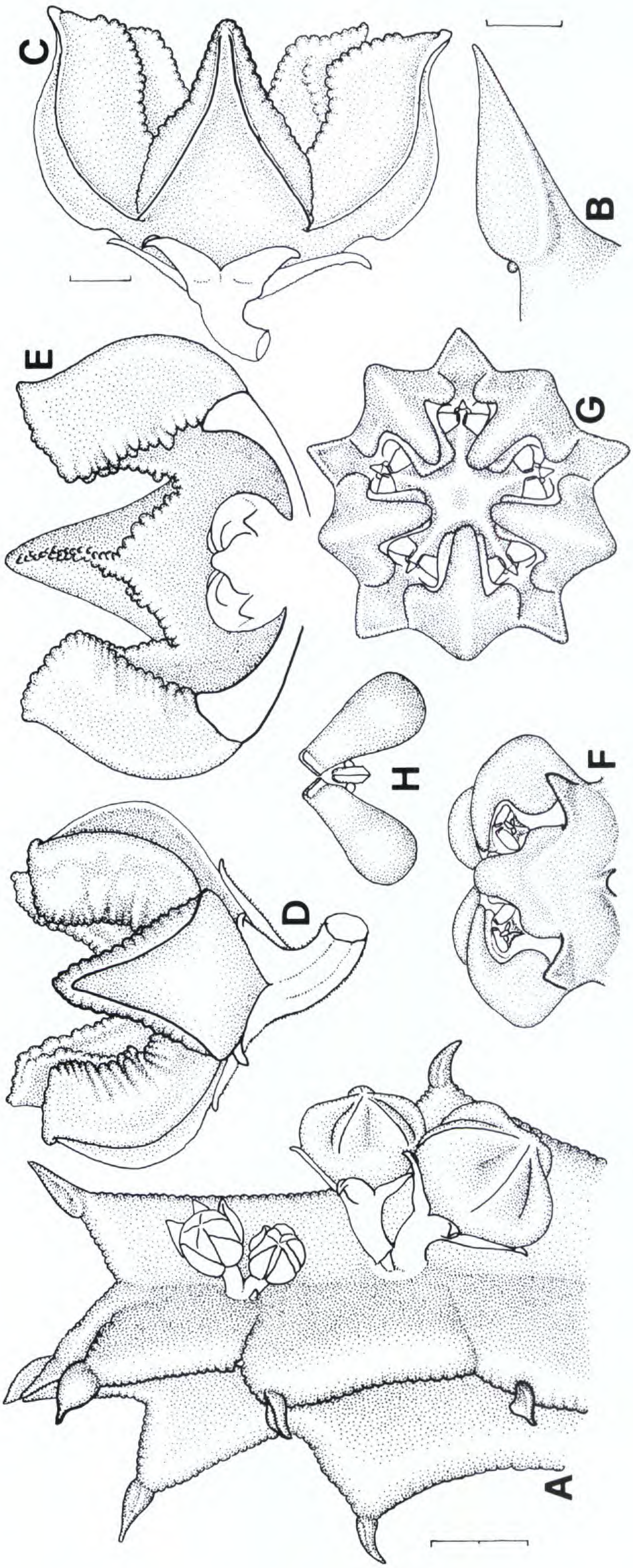

Figure 1. *Baynesia lophophora* Bruyns. —A. Upper part of stem. —B. Side view of leaf-rudiment. —C, D. Side views of flower. —E. Side view of dissected flower. —F. Side view of gynostegium. —G. Face view of gynostegium. —H. Pollinarium. Scale bars: A, 2 mm; B, F, G, 0.5 mm (at B); C, D, 1 mm (at C); E, 1 mm (at A). Drawn from *Bruyns 8000*.

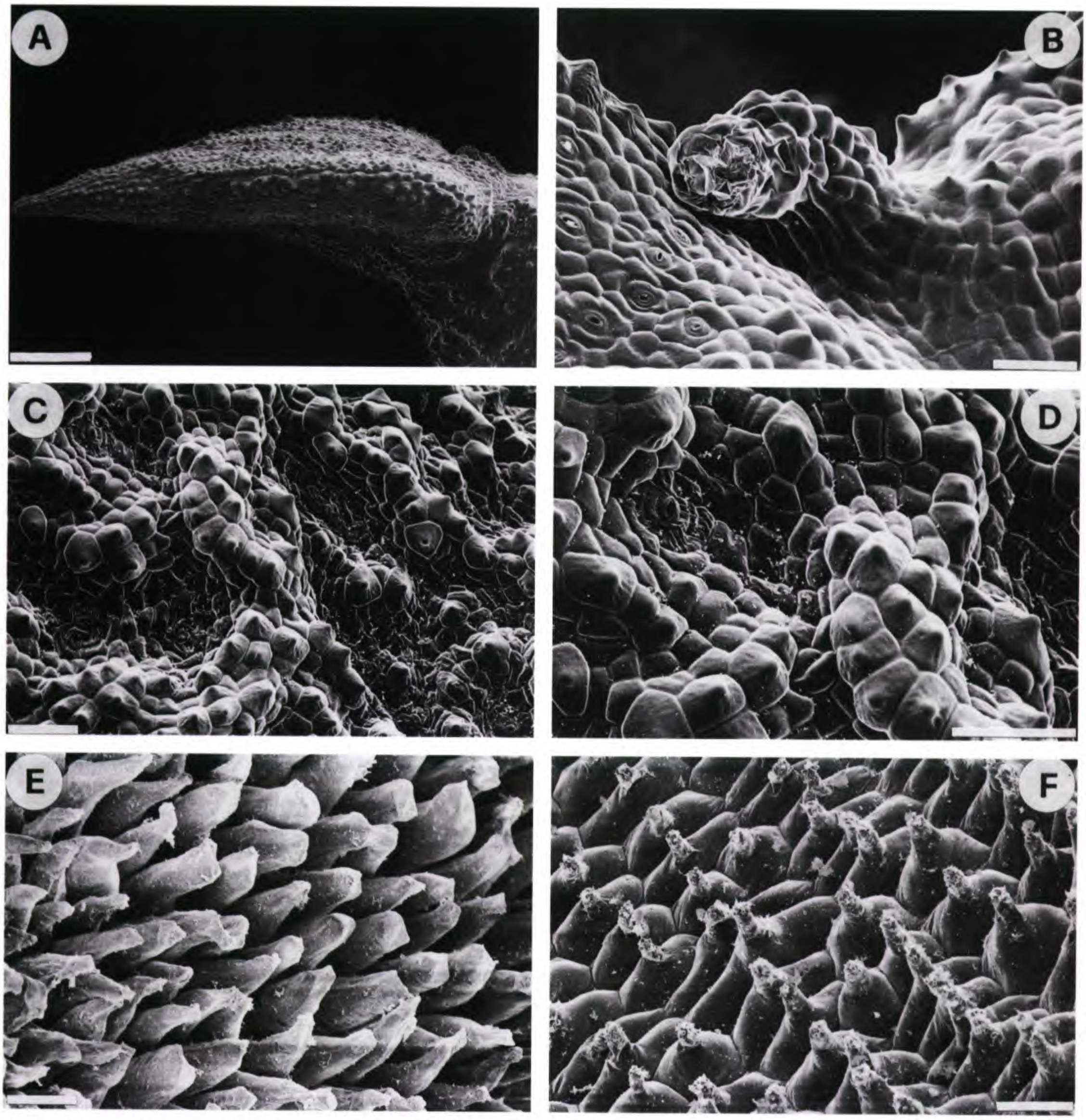

Figure 2. SEM views of surface of stem, stipular denticle, and inner surface of corolla in *Baynesia lophophora* (*Bruyns 8000*). —A. Leaf-rudiment. —B. Stipular denticle. —C, D. Rugulose surface of stem with stomata in dips beween ridges. E, F. Basal epidermal cells inside corolla:—E. On dark, crested part of lobe. —F. In corolla tube. Scale bars: A, 250 μm; B, 50 μm; C, D, 100 μm; E, F, 25 μm.

doorn, *Cotyledon orbiculata* L., *Euphorbia otjipembana* L. C. Leach, and *Sarcostemma viminale* (L.) R. Brown are common, and *Adenium obesum* (Forsskål) Roemer & Schultes, *Crassula tabularis* Dinter, and *Stapelia schinzii* var. *angolensis* Kers also occur, though more sporadically. On the relatively flat summits of these mountains the vegetation is practically devoid of succulents, being dominated by short trees and a thick cover of grass in years of reasonable rainfall. Immediately above the cliffs there is an apparently quite dry, rocky, transitional fringe with very shallow soils. This is covered by short tufts of grass and shrublets of *Petalidium* Nees, and there are occasional specimens of *Euphorbia otjipembana*, *E. mauritanica* L., *E. monteiroi* Hooker f., and *Stapelia schinzii* var. *angolensis*. It is in this transitional fringe that *B. lophophora* occurs, and here it is quite common, with the plants usually well concealed inside tufts of grass.

Diagnostic features and relationships. Plants of *Baynesia* are mostly small, consisting of a cluster of erect, greenish stems. The 4-angled stems are comparatively soft and have a rugulose surface, which is covered with fine papillae. Each of the obscure tubercles bears a leaf-rudiment, which soon falls off. Stipular denticles are very intermit-

tently present with often only one per tubercle, while most tubercles have none at all.

Flowers are borne in small clusters around the tips of the stems on new growth, and they are small, nodding, and apparently without any scent. Inside they are a deep maroon on the lobes changing to cream in the tube. The tube is more or less hemispherical, and the lobes are erect around its mouth. Each lobe has its margins quite well folded back, and there is a peculiar ridge of papillae running along either side of its innermost surface from the mouth of the tube toward its apex. This makes the lobe appear crested on the inside. This crest is somewhat emphasized by the strongly recurved apices of the lobes.

The particularly small corona lies at the bottom of the tube and is very slightly raised above the base. The minute outer lobes are transparent except for a dark maroon patch under the guide-rails, and the inner corona is cream but slightly more intense than the cream of the tube.

The generic position of this new species is problematic. The rugulose surface of the stems is particularly unusual and is unlike anything else known in southern Africa. Rugulose stem-surfaces are found in *Echidnopsis leachii* Lavranos from Tanzania (Bruyns, 1988), and stem surfaces are longitudinally bullate in most species of *Stapelianthus* Choux (unpublished data) from Madagascar and in *Rhytidocaulon* P. R. O. Bally from northeast Africa and Arabia (Bruyns, 1999). The surface is raised into low "hills" also in the southern African genus *Lavrania* Plowes (Bruyns, 1993). It is more regularly divided into raised polygons in *Pseudolithos* (Bruyns & Meve, 1995), a small genus of five species occurring in northeast Africa and Oman in southern Arabia. This new species bears a considerable likeness to *P. dodsonianus* (Lavranos) Bruyns & Meve. This likeness continues into the epidermal cells on the stems, which also have their outer walls raised into papillae in *Baynesia*. The leaf-rudiments in *Baynesia* are larger than those of any *Pseudolithos*, and occasionally they have small stipular denticles, which are never found in *Pseudolithos*. *Baynesia* also bears some similarity to *Rhytidocaulon*. Here the surface of the stem is rugulose, but quite long, hair-like papillae project from it at intervals while the surface between them is smooth. The leaf-rudiments in *Rhytidocaulon* are rather differently shaped, with a narrow base and some evidence of a midrib and blade (Bruyns, 1999).

The 4-angled stems with many small inflorescences near their apices and the small flowers all suggest a relationship with *Caralluma*. *Caralluma* is not well represented in southern Africa (with only 1 species in Namibia); the majority of the roughly 56 species (Gilbert, 1990) is found north of the equator. While there is a wide variety of corolla forms and coronal structures in *Caralluma*, the curiously ridged and papillate, crested corolla lobes in *B. lophophora* are unique, and the stems in *Caralluma* are neither rugulose nor papillate. Leaf-rudiments are always present in *Caralluma*, stipular denticles are nearly always present, and marginal hairs on the leaf-rudiments and around the stipular denticles are common. Apart from the marginal hairs, these features are shared with *Baynesia*.

Characters of the pollinaria have often proved helpful to delimit genera of stapeliads (Gilbert, 1990; Meve, 1994, Bruyns & Meve, 1995, Bruyns, 1995, 1999). Those of *B. lophophora* are particularly unusual. While the pollinia in *Caralluma* may be broader than long (relative to the anther that has produced them), they are exceptionally broad in *B. lophophora* and have also remarkably minute caudicles and wings on the corpuscles. This is unmatched anywhere in *Caralluma* or in *Pseudolithos*. In *Pseudolithos* the pollinia are longer than broad, the corpuscle is disproportionately large, and the insertion-crest is twisted onto the upper surface of the pollinium (Bruyns & Meve, 1995). None of these features is present in *Baynesia*. In *Baynesia* the shape of the pollinium is similar to that in *Rhytidocaulon* (broader than long), and in both genera the insertion-crest lies exactly along the edge of the pollinium.

There are so many unusual features both in the vegetative parts and in the flowers of this new species that placing it in any of the known genera is impossible, and it is considered that a separate genus is justified for it. I have been unable to locate any other specimens in herbaria of this new species.

The generic name is derived from the Baynes Mountains where the plants were found. These were, in turn, named after the English explorer Maudsley Baynes, who first investigated the area in 1911.

To summarize, the various genera that could be related to *Baynesia* may be distinguished as follows. Only genera in which the inflorescences are numerous and usually toward the apex of the stems are included (consequently *Stapelianthus*, which is mentioned above, is not dealt with in the key). *Quaqua* N. E. Brown, which is not mentioned above, is also included.

1. Stems with 6 or more angles . . . . . *Echidnopsis*
1′. Stems 4-angled 2
2(1). Stems covered with convex polygons, pollinar-

ia with large corpuscle almost equaling length of pollinium . . . . . *Pseudolithos*
2′. Stems not covered with convex polygons, corpuscle much shorter than length of pollinium 3
3(2). Each tubercle tipped (when young) with a minute and slightly expanded leaf-rudiment . . . 4
3′. Each tubercle tipped with a sharply conical and rapidly hardening tooth . . . . . *Quaqua*
4(3). Stems neither rugulose nor papillate *Caralluma*
4′. Stems rugulose and papillate 5
5(4). Stems tapering toward tips, with hair-like papillae projecting at intervals from otherwise smooth surface, leaf-rudiments erect . . . . . *Rhytidocaulon*
5′. Stems not tapering toward tips, with only low papillae on surface, leaf-rudiments spreading . . . . . *Baynesia*

Acknowledgments. This research was partially funded by a grant from the University of Cape Town Reseach Council. Victoria Hollowell and an anonymous reviewer are thanked for their efforts to improve the manuscript.

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Scleria robusta, a New Name for *Scleria grandis* Core (Cyperaceae)

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ABSTRACT. *Scleria robusta* Camelbeke & Goetghebeur is proposed as a new name for the later homonym *Scleria grandis* Core.

When Core (1945) published a new neotropical species of *Scleria* (Cyperaceae), naming it *Scleria grandis* Core, he overlooked the fact that this combination had already been used by Labillardière (1800) for the Australian species now generally recognized as *Gahnia grandis* (Labillardière) S. T. Blake (see, e.g., Wilson, 1994: 281). It was indeed Blake (1969: 33) who made the correct combination in *Gahnia*, including the homotypic synonym *Gahnia psittacorum* Labillardière. However, he did not propose a new name for *Scleria grandis* Core, and therefore an avowed substitute for this later homonym must be proposed.

Scleria robusta Camelbeke & Goetghebeur, nom. nov. Replaced name: *Scleria grandis* Core, J. Wash. Acad. Sci. 35(10): 322. 1945, not Labillardière, Voy. Rech. Pérouse: 146. 1800. TYPE: Colombia. Vaupés: Selva del Tui-Igarape, cerca de Mitu, 200 m, 17 Sep. 1939, *J. Cuatrecasas 6870* (lectotype, selected here, US 1795819; isolectotype, US 1795820).

This distinctive member of section *Hymenolytrum* is distinguished from its nearest relative, *Scleria cyperina* Kunth, by the broader leaves (18–45 vs. 7–15 mm), the broader foliaceous primary bracts (18–35 vs. 6–13 mm), the smooth nutlet, and the more robust habit of the former; hence *robusta* as a new epithet.

Paratypes. COLOMBIA. **Caquetá:** Cerro de La Sardina, Florencia, bosque, ca. 500 m, 30 Mar. 1940, *J. Cuatrecasas 8890* (US). BRAZIL. **Amazonas:** Santa Isabel, Rio Negro, 15–16 Feb. 1944, *J. T. Jr. Baldwin 3421* (US 2 sheets).

Acknowledgments. We thank Paul E. Berry (WIS) for bringing this nomenclatural problem to our attention. Karen L. Wilson (NSW) is thanked for the fruitful discussion and help. The US curator is acknowledged for loan of the type specimens of *Scleria grandis* Core, and the FI curator for providing photos of the Labillardière material. The librarians of BR and NY are thanked for providing photocopies of the requisite old literature. Tony Reznicek (MICH) and an anonymous reviewer are thanked for useful comments on the manuscript.

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Nuevas Especies y Sinónimos de *Acalypha* L. (Euphorbiaceae) de Ecuador

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RESUMEN. Se describen e ilustran dos nuevas especies ecuatorianas de *Acalypha* L., *A. websteri* y *A. stellata*, y se comentan las principales diferencias con las especies afines. Se proponen también seis nuevos sinónimos de cuatro especies presentes en Ecuador.

ABSTRACT. Two new species of *Acalypha* L. are described and illustrated, *A. websteri* and *A. stellata*, based on Ecuadorian material. Comments on the systematics of related species are included. As well, six new synonyms are proposed for four Ecuadorian species.

Con motivo de la revisión de *Acalypha* para la *Flora of Ecuador*, se estudió el material del género existente en numerosos herbarios americanos y europeos. Un resultado de este trabajo ha sido el hallazgo de dos nuevas especies que se describen aquí. Además, diversos nombres de especies ecuatorianas quedan reducidos a sinónimos después del estudio de las diferentes colecciones tipo.

De los grandes géneros de Euphorbiaceae, *Acalypha* es uno de los menos conocidos. Posee unas 450 especies de distribución principalmente tropical y subtropical, con algunos representantes en zonas templadas. Desde el tratamiento de Pax y K. Hoffmann (1924) apenas se han realizado estudios críticos del género. Después de la revisión de las especies de Colombia, Venezuela y las Guayanas (Cardiel, 1995b, 1999) actualmente estudiamos las especies de Ecuador, Perú y Bolivia, con el fin de preparar los correspondientes tratamientos florísticos. El objetivo, a más largo plazo, es la revisión del género en todo el ámbito neotropical y la preparación del tratamiento de *Acalypha* para *Flora Neotropica*.

Las dos especies nuevas descritas pertenecen al subgénero *Acalypha*, caracterizado principalmente por tener las flores femeninas sésiles, en la axila de brácteas generalmente foliáceas y acrescentes. Este subgénero engloba la mayor parte de las especies de *Acalypha*.

Acalypha websteri Cardiel, sp. nov. TIPO: Ecuador. Chimborazo: Huigra, ca. 1200 m, 15 Feb. 1955, *E. Asplund 15427* (holótipo, S). Figura 1.

Speciei *A. padifoliae* Kunth similis, a qua praecipue differt inflorescentiis foemineis longioribus (plus quam 10 cm longis) atque bracteis foemineis subtriangularibus, dentibus centralibus multo longioribus quam ceteris pilisque glanduliferis ca. 0.5 mm longis.

Arbusto de ca. 2 m de altura, monoico; ramas jóvenes delgadas, finamente pubescentes o velutinas, glabrescentes. Estípulas de 4–6 mm de largo, linear-lanceoladas, adpreso-pubescentes. Pecíolos de (3–)4–7 cm de largo, con indumento similar al de las ramas jóvenes. Láminas foliares de 7–15 × (3–)3.5–8.5 cm, ovado-lanceoladas, a veces oblongo-lanceoladas, membranáceas; base de redondeada a cordada; ápice de agudo a acuminado, acumen mucronado; margen aserrado, dientes anchos, profundos, obtusos y ligeramente callosos en el ápice; haz laxamente pubescente, con pelos cortos y finos; envés velutino-pubescente, glabrescente; nervación palmeada, con 3 a 5 nervios basales y 6 a 10 pares de nervios secundarios; estipelas ausentes. Inflorescencias espiciformes, unisexuales. Inflorescencias masculinas (sólo una conocida) de 12 cm de largo, terminales, laxifloras; pedúnculo de ca. 1 cm de largo; raquis delgado, hispiduloso; brácteas triangular-lanceoladas, ciliado-hispídulas; flores en glomérulos. Inflorescencias femeninas de hasta 12 cm de largo, terminales; pedúnculo de ca. 0.5 cm de largo; raquis grueso, densamente velutino-pubescente; brácteas de ca. 1.5 mm de largo en la antesis, ciliado-hispídulas, acrescentes en el fruto, de hasta 13 × 7 mm, subtriangulares, con indumento adpreso de pelos simples más denso en los nervios, y pelos glandulíferos de ca. 0.5 mm de largo, gruesos, más abundantes en el margen, margen con ca. 15 dientes agudos, el central muy prominente, lanceolado y acuminado. Flores masculinas inconspícuas con cáliz y pedicelos hispidulosos. Flores femeninas sésiles; cáliz con 3 sépalos de ca. 0.7 mm de largo, triangulares, hispidulosos, persistentes en el fruto; ovario de ca. 1 mm de diámetro, densamente pubescente; estilos

Figura 1. *Acalypha websteri* Cardiel. —A. Fragmento de una rama con inflorescencia femenina. —B. Detalle de una rama, pecíolo y estípulas. —C. Detalle de la inflorescencia femenina. —D. Bráctea femenina en fruto (acrescente). —E. Cáliz de la flor femenina. —F. Ovario y estilos. —G. Cápsula. (De holótipo, *Asplund 15427*.)

libres, de 5–6 mm de largo, cada uno dividido en 8–10 ramas finas, con algunos pelos dispersos. Cápsulas de ca. 2 mm de diámetro, pubescente; semillas maduras no observadas.

Distribución. Esta especie es conocida solamente por dos colecciones de la misma localidad, en la vertiente Este de la Cordillera Occidental, a 1200–1400 m de altitud.

Discusión. *Acalypha websteri* está relacionada con un grupo de especies andinas de Perú y Bolivia, que se caracterizan por presentar inflorescencias femeninas terminales. Estas son: *A. benensis* Britton, *A. eugeniifolia* Rusby, *A. mapirensis* Pax, *A. padifolia* Kunth, *A. peruviana* Müller Argoviensis, *A. stenoloba* Müller Argoviensis y *A. stricta* Poeppig. La situación de este grupo es aún incierta y posiblemente se modifique cuando se concluya la revisión del género en estos países. De estas especies sólo *A. padifolia* y *A. peruviana* tienen brácteas glandulosas (al igual que *A. websteri*), pero *A. peruviana* se distingue con claridad por sus brácteas lanceolado-aristadas y por las estípulas orbiculares. De las especies ecuatorianas *A. websteri* sólo podría confundirse con *A. padifolia* Kunth, pero ésta tiene hojas menores (de 6–9 × 2.5–3.5 cm), estrechamente ovado-lanceoladas, inflorescencias femeninas de 5–8 cm de largo, y brácteas orbiculares con el diente central generalmente no prominente y con pelos glandulíferos de ca. 1 mm de largo.

Esta especie esta dedicada a Grady L. Webster, principal especialista en Euphorbiaceae americanas.

Parátipo. ECUADOR. **Chimborazo**: Huigra, ca. 1400 m, 15 Feb. 1955, *E. Asplund 15425* (S).

Acalypha stellata Cardiel, sp. nov. TIPO: Ecuador. Bolívar: Limón, estribaciones de la Cordillera Occidental, 880–1100 m, 14 Oct. 1943, *M. Acosta Solís 6339* (holótipo, F; isótipo, F). Figura 2.

Speciei *A. dictyoneurae* Müller Argoviensis valde similis, a qua inflorescentiis foemineis semper terminalibus atque bracteis foemineis stylisque stellatim pilosis praecipue differt.

Arbusto o árbol pequeño de hasta 4 m de altura, monoico; ramas jóvenes con indumento de aspecto pulverulento y flocoso, amarillento o ferrugíneo, formado por diminutos pelos estrellados, ramas adultas glabrescentes. Estípulas de 4–5 mm de largo, lineares, con indumento similar al de las ramas jóvenes, caducas. Pecíolos de (3–)5–8(–9) cm de largo, con indumento similar al de las ramas jóvenes. Láminas foliares de (8–)12–17(–20) × (4–)6–12 cm, ovado-lanceoladas, a veces muy ensanchadas en la base, membranáceas, tendiendo a subcoriáceas en la senectud; base de redondeada a cordada; ápice de agudo a acuminado, acumen agudo o mucronado; margen aserrado, dientes pequeños y agudos; haz con indumento más o menos laxo de diminutos pelos estrellados; envés amarillento o ferrugíneo, densamente cubierto de pelos estrellados; nervación palmeada, prominente y reticulada por el envés, con 3 a 5 nervios basales y 6 a 8(–10) pares de nervios secundarios; estipelas ausentes. Inflorescencias espiciformes, unisexuales. Inflorescencias masculinas de 5–11(–14) cm de largo, axilares, densifloras, sésiles o subsésiles; raquis con pelos estrellados; brácteas diminutas, lanceoladas, ciliado-hispidulosas; flores en glomérulos densos. Inflorescencias femeninas de hasta 16(–18) cm de largo, terminales; sésiles o con pedúnculo de 0.5 cm de largo; raquis pubescente, con pelos estrellados; brácteas de ca. 2 mm de largo en la antesis, lanosas, triangular-lanceoladas, denticuladas; brácteas en el fruto acrescentes, suborbiculares, de 5–9 mm de diámetro, con pelos glandulíferos de hasta 2 mm de largo, principalmente en el margen y pelos estrellados dispersos, margen con 14–16 dientes pequeños, obtusos, el central ligeramente prominente. Flores masculinas inconspícuas, con cáliz y pedicelo densamente pubérulos. Flores femeninas sésiles; cáliz con 3 sépalos de ca. 1 mm de largo, triangular-lanceolados, lanosos, ciliados; ovario de ca. 1 mm de diámetro, lanoso; estilos libres, de 4–5 mm de largo, cada uno dividido en 18–21 ramas, con pelos estrellados en la mitad basal. Cápsula de ca. 2.5 mm de diámetro, con pelos estrellados dispersos; semillas de ca. 1.5 × 1 mm, ovoides o elipsoides, con diminutas fovéolas, carúncula obsoleta.

Distribución. *Acalypha stellata* se encuentra en las estribaciones de la Cordillera Occidental de Ecuador, en las provincias de Bolívar, Chimborazo y El Oro, entre 500 y 1100 m de altitud. Aparece asociada a bosques y matorrales húmedos.

Discusión. Los pelos estrellados son un carácter muy raro en *Acalypha.* En América sólo conocemos otra especie que los presente, *Acalypha dictyoneura* Müller Argoviensis que se encuentra en la zona andina de Ecuador y Perú y es morfológicamente muy próxima a *A. stellata*; no obstante, pueden diferenciarse con claridad porque las brácteas femeninas y los estilos de *A. dictyoneura* nunca poseen pelos estrellados, y las inflorescencias femeninas son generalmente axilares. Existe también una clara diferencia altitudinal; todas las colecciones conocidas de *A. stellata* se encuentran entre 500 y 1100 m, mientras que *A. dictyoneura* se encuentra generalmente entre 1800 y 2500 m (nunca por debajo de 1200 m).

Parátipos. ECUADOR. **Bolívar:** Charquiyacu, descenso inferior de la Cordillera Occidental, 600 m, 03 Oct. 1943, *M. Acosta Solís 6086* (F); Balsabambo, 500 m, 23 Oct. 1933, *H. J. Schimpff 285* (GH, M, MO); Cantón Guaranda, 14.5 km by road E of Caluma, 975 m, 79°02′W, 1°35′S, 23 Oct. 1933, *G. L. Webster, B. Smith & R. Friend*

Figura 2. *Acalypha stellata* Cardiel. —A. Fragmento de una rama con inflorescencias femeninas. —B. Detalle del pecíolo, rama y estípulas. —C. Detalle de la haz foliar. —D. Detalle del envés foliar. —E. Detalle de la inflorescencia femenina. —F. Bráctea femenina en fruto (acrescente). —G. Cáliz de la flor femenina. —H. Ovario y estilos. —I. Cápsula. —J. Semilla. (De holótipo, *Acosta-Solís 6339*, y *Øllgaard & Balslev 9023*.)

30714 (DAV). **Chimborazo:** road General Elizalde (Bucay)–Pallatanga, 32 km from Pallatanga, 650 m, 79°02′W, 2°09′S, 29 Aug. 1976, *B. Øllgaard & H. Balslev 9023* (AAU, C, MO, NY). **El Oro:** 10 km W of Pinas, 900 m, 8 Oct. 1989, *C. Dodson, A. Gentry & G. Shupp 8975* (MO).

NUEVOS SINÓNIMOS

Acalypha cuspidata Jacquin, Pl. Hort. Schoenbr. 2: 63. tab. 243. 1797. TIPO: Venezuela. "Crescit ad Caracas", tab. 243 in Jacq., loc. cit. (lectótipo, designado por J. M. Cardiel, 1995a: 233).

Acalypha tenuipes Pax & Hoffmann, in A. Engler, Pflanzenr. IV, 147, XVI (Heft 85): 122. 1924. Syn. nov. TIPO: Ecuador. Manabí: Agua Amarga, El Recreo. *H. Eggers 15833* (holótipo, B no visto, probablemente destruido, fragmento en US, fotos en F, GH, NY; isótipos, M, L).

Sólo conocemos *Acalypha tenuipes* por la colección tipo, no habiendo sido citada con posterioridad en Ecuador. Macbride (1951) la cita para Perú basándose en la colección *Weberbauer 7662*, pero posteriormente no fue reconfirmada en el *Catálogo de las Angiospermas y Gimnospermas del Perú* (Brako & Zarucchi, 1993). *Acalypha cuspidata* se encuentra ampliamente distribuida en el continente americano (Cardiel, 1999) y es morfológicamente indistinguible de la colección tipo de *A. tenuipes*. En Sudamérica conocemos *A. cuspidata* de Colombia, Venezuela y Ecuador, generalmente en hábitats costeros.

Acalypha padifolia Kunth, in Humboldt & Bonpland, Nov. Gen. Sp. 2: 97. 1817. TIPO: Colombia. Nariño: "Crescit locis sylvaticis subfrigidis inter Almaguer et Pasto, prope villam Meneses, alt. 1322 hex.", *A. von Humboldt & A. Bonpland 2136* (síntipos, P-Bonpl., P).

Acalypha andina Müll. Arg., Flora 55: 26. 1872. Syn. nov. TIPO: Ecuador. "Inter Bannas et rio Verde altitudine circ. 5000 ped.", *M. F. Wagner s.n.* (holótipo, M, foto en F).

Acalypha tunguraguae Pax & Hoffmann, in A. Engler, Pflanzenr. IV, 147, XVI (Heft 85): 66. 1924. Syn. nov. TIPO: Ecuador. "Vulkan Tunguragua", *F. C. Lehmann 6641* (holótipo, B no visto, probablemente destruido, fotos en GH, NY).

Acalypha schimpffii Diels, Biblioth. Bot. 29: 103. 1937. Syn. nov. TIPO: Ecuador. Chimborazo: "Tal des R. Chanchan bei Huigra, an buschigen Abhängen", 1260 m, 21 Sep. 1933, *F. L. E. Diels 1128* (síntipo, no visto), *H. J. F. Schimpff 429* (síntipos, GH, M, MO, NY, US).

Acalypha padifolia se encuentra en los Andes de Bolivia, Colombia, Ecuador y Perú. Es una especie muy variable en la forma y tamaño de las hojas. Las inflorescencias sufren una gran transformación durante su crecimiento, especialmente las brácteas femeninas acrescentes. Esto ha motivado que se describieran diferentes especies basadas en ramas floríferas en distintos estados de desarrollo. Macbride (1951) ya menciona las frágiles diferencias entre algunas de estas especies. Al igual que ocurrió al revisar las colecciones colombianas (Cardiel, 1995a), el estudio de las colecciones ecuatorianas y de los ejemplares tipo ha aportado nuevos sinónimos a esta especie.

Acalypha salicifolia Müll. Arg., Flora 47: 438. 1864. TIPO: Ecuador. "In Andibus Ecuadorensibus", *R. Spruce 4963* (holótipo, W, foto en GH).

Acalypha macbridei Johnston, Contr. Gray Herb. 75: 28. 1925. Syn. nov. TIPO: Perú. Huanaco: Pampayacu, hacienda at mouth of Rio Chiao, *J. F. Macbride 5093* (holótipo, F; isótipo, GH).

La colección tipo de *Acalypha salicifolia* es una rama juvenil con las hojas de pequeño tamaño, y muy diferentes a las hojas de la colección tipo de *A. macbridei*. No obstante, no observamos diferencias significativas en los caracteres florales. Después del estudio de numerosas colecciones de Ecuador y Perú hemos comprobado que las láminas foliares son muy polimorfas, y no existen diferencias que justifiquen mantener separadas estas especies.

Acalypha schiedeana Schlechtendal, Linnaea 7: 384. 1832. TIPO: México. "In sylvis umbrosis Jalapae", *C. J. W. Schiede 72* (holótipo, B no visto, probablemente destruido, foto en G).

Acalypha ecuadorica Pax & Hoffmann, in A. Engler, Pflanzenr. IV, 147, XVI (Heft 85): 68. 1924. Syn. nov. TIPO: Ecuador. "Agua Amarga bei Elrecreo, trockene Gebüsche", *H. Eggers 15535* (holótipo, B no visto, probablemente destruido, foto en NY; isótipos, BM, G, GH, L, M, MA, NY, PR).

Acalypha schiedeana fue descrita del sur de México, donde es muy frecuente, y su distribución es poco conocida. En Centroamérica se ha citado de Guatemala (Standley & Steyermark, 1949), Nicaragua (Seymour, 1979) y Costa Rica (Burger & Huft, 1995). En Sudamérica se ha citado para Venezuela (Pittier et al., 1947; Levin, 1999; Cardiel, 1999) y de Colombia (Cardiel, 1995b). En Ecuador esta especie no había sido citada con anterioridad.

Acalypha ecuadorica fue descrita sobre unos ejemplares de la costa pacífica ecuatoriana, con las inflorescencias inmaduras. Desde entonces no ha vuelto a ser citada. Jørgensen y León (1999) la recogen en el catálogo de las plantas ecuatorianas

mencionando sólo la colección tipo, de la que existen numeroso duplicados.

La mayoría de las colecciones ecuatorianas que hemos estudiado pertenecen a la vertiente pacífica, en un hábitat similar al de las colecciones de Colombia y Venezuela. Consideramos que en Ecuador se encuentra el límite meridional en la distribución de esta especie.

Agradecimientos. Este trabajo se ha desarrollado gracias a la concesión de una beca postdoctoral de la Comunidad de Madrid. También se ha beneficiado de cierta ayuda por parte del proyecto *Flora Ibérica.* Agradezco también a Santiago Castroviejo y Javier Fuertes, la revisión del manuscrito; a Manuel Laínz, la versión latina de las diagnosis, y a Juan Castillo, las ilustraciones.

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New Combinations in *Tillaea* (Crassulaceae)

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ABSTRACT. On the basis of molecular data, the present authors will recognize *Crassula* L. and *Tillaea* L. as distinct genera in the forthcoming account of the Crassulaceae for the *Flora of China*, Volume 8. *Tillaea* is represented in the *Flora* area, but *Crassula* sensu stricto is not. With this arrangement, the correct name for *T. pentandra* Royle ex Edgeworth, described from the Himalayas, would be a new combination based on *Crassula schimperi* C. A. Meyer, described from Ethiopian material but clearly synonymous. The taxonomic identity of the latter name has been overlooked by authors working on Asian floras. Therefore, the new combination *T. schimperi* (C. A. Meyer) M. G. Gilbert, H. Ohba & K. T. Fu is made here along with new combinations for two subspecies found in tropical Africa and formerly treated under *Crassula*: *T. schimperi* subsp. *phyturus* (Mildbraed) M. G. Gilbert, H. Ohba & K. T. Fu and *T. schimperi* subsp. *transvalensis* (Kuntze) M. G. Gilbert, H. Ohba & K. T. Fu.

The separation of *Tillaea* L. from *Crassula* L. has been somewhat controversial. The last major revision of *Crassula* (Tölken, 1977) kept the two genera together. This has been followed by all the major African floras (Fernandes, 1983; Gilbert, 1989; Wickens, 1987) and the *Flora of Bhutan* (Grierson, 1987). More recently, however, molecular data have suggested that there is a case for keeping *Tillaea* as a genus distinct from *Crassula*. An analysis of chloroplast DNA restriction-site variation has indicated that *Tillaea* is most closely related to *Crassula*, but that the two genera exhibit a relatively high level (4.8%) of sequence divergence (Ham, 1995; Ham & 't Hart, 1998). This separation is being followed in the forthcoming account of the Crassulaceae (Fu & Ohba, in press) for the *Flora of China*, Volume 8, where *Tillaea* occurs, but not *Crassula* sensu stricto.

Most botanists working on Asian plants have used the name *Crassula pentandra* (Royle ex Edgeworth) Schönland, based on *T. pentandra* Royle ex Edgeworth (1846), which was described from Himalayan material for a widespread, often common, montane species occurring in Xizang Autonomous Region (Tibet) within the *Flora of China* area. Though it typically grows in somewhat drier habitats than most species of *Tillaea*, it is clearly referable to this genus on the basis of its inconspicuous, axillary inflorescence, in contrast to the conspicuous, terminal inflorescence of *Crassula* sensu stricto.

These workers took the view that the Asian plants are not conspecific with any material from Africa. However, Himalayan material differs in no way from *Crassula schimperi* C. A. Meyer (1842), described on the basis of material from Ethiopia. This species has never been formally treated as a species of *Tillaea*. This means that a new combination is needed to make the name available for the *Flora of China*. Three rather well-defined subspecies of *C. schimperi* have been recognized in tropical Africa, only one of which significantly extends into Asia (subsp. *schimperi*), and new combinations in *Tillaea* are made for these, too.

Tillaea schimperi (C. A. Meyer) M. G. Gilbert, H. Ohba & K. T. Fu, comb. nov. Basionym: *Crassula schimperi* C. A. Meyer, in Fischer, C. A. Meyer & Avé-Lallemant, Index Sem. Hort. Petrop. 8: 56. 1842. TYPE: cultivated in St. Petersburg, Russia, from seed collected in Ethiopia: "Semina (N. 183) in Abyssinia legit cel. Schimper" (holotype, LE not seen; isotype, K).

Tillaea schimperi subsp. **schimperi**

Tillaea pentandra Royle ex Edgeworth, Trans. Linn. Soc. London 20: 50. 1846. *Crassula pentandra* (Royle ex Edgeworth) Schönland, in Engler & Prantl, Nat. Pflanzenfam. 3(2): 37. 1891. TYPE: [NW] India. "Himalaya, Garhwal, altit. 4–6000 ped.," s.d., *Edgeworth 97* (lectotype, designated by Wickens (1982: 666), K).

Habitat. Moist, well-drained, often shaded sites on rocks, earth banks, fallen logs, often in montane forest, sometimes epiphytic; (1500–)2000–4800 m.

Distribution. Africa: Cameroon, Chad (Tibesti), Ethiopia, Kenya, Sudan, Tanzania, Uganda, Zaire, Zambia; Asia: Bhutan, China, India, Nepal, Pakistan, Yemen.

Tillaea schimperi subsp. **phyturus** (Mildbraed) M. G. Gilbert, H. Ohba & K. T. Fu, comb. nov. Basionym: *Crassula phyturus* Mildbraed, Notizbl. Bot. Gart. Berlin-Dahlem 8: 227. 1922. *Crassula pentandra* (Royle ex Edgeworth) Schönland var. *phyturus* (Mildbraed) Hedberg, Symb. Bot. Upsal. 15: 100. 1957. *Crassula schimperi* C. A. Meyer subsp. *phyturus* (Mildbraed) R. Fernandes, Bol. Soc. Brot., sér. 2, 52: 172. 1978. TYPE: Kenya. "Östl. Mt. Elgon, im Wald, 10 000 Fuß," June 1920, *G. Lindblom s.n.* (holotype, S not seen).

Habitat. Basement-complex rock outcrops, often seasonally moist but fully exposed.

Distribution. Africa: Ethiopia, Kenya, Sudan, Tanzania, Uganda; Asia: Yemen (Socotra).

Tillaea schimperi subsp. **transvalensis** (Kuntze) M. G. Gilbert, H. Ohba & K. T. Fu, comb. nov. Basionym: *Sedum transvalense* Kuntze, Rev. Gen. Pl. 3(2): 85. 1898. *Crassula transvalensis* (Kuntze) K. Schumann, Just's Bot. Jahresber. 26(1): 347. 1900. *Crassula schimperi* C. A. Meyer subsp. *transvalensis* (Kuntze) R. Fernandes, Bol. Soc. Brot., sér. 2, 52: 172. 1978. TYPE: South Africa. "Transvaal: Johannisburg," s.d., *Kuntze s.n.* (holotype, NY not seen).

Habitat. Rocky outcrops, sandy soil in grassland.

Distribution. Africa: Angola, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zimbabwe.

Fernandes (1983) maintained three varieties within this taxon, but we are reluctant to make new combinations for quadrinomials not familiar to us. The taxon is named after the Transvaal in South Africa, and subsequent authors have used this more usual spelling and rendered the epithet "*transvaalensis*," treating the original version as if it were an orthographic error. However, Kuntze used "*transval-*" for three other species in the same publication but never used "*transvaal-*," so the former spelling is obviously deliberate and cannot be treated as an error.

Acknowledgment. We thank Nicholas J. Turland (MO) for help in preparing the manuscript.

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A New *Dalechampia* L. (Euphorbiaceae) from Southern Costa Rica

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ABSTRACT. A new species of *Dalechampia* L. (Euphorbiaceae) with 5-foliolate leaves is described from southern Costa Rica, compared with its closest relative, and illustrated.

RESUMEN. Una nueva especie de *Dalechampia* L. (Euphorbiaceae) con hojas 5-folioladas, se describe de la región sur de Costa Rica, se compara con otra especie cercana y se ilustra en este artículo.

Dalechampia L. is a genus of about 115 mostly neotropical species (Burger & Huft, 1995). Eleven species have recently been accounted for in Costa Rica (Burger & Huft, 1995). Except for *D. spathulata* (Scheidweiler) Baillon, an erect subshrub, the Costa Rican taxa are clambering vines with leaves that vary from simple and unlobed, with 5 palmate veins, to 2–3-lobed, and to trifoliolate. A new *Dalechampia* with 5-foliolate leaves from southern Costa Rica is described below.

Dalechampia burgeriana Gómez-Laurito, sp. nov. TYPE: Costa Rica. Puntarenas. Coto Brus, Fila Cruces, entrada de los Atunes y orilla de la quebrada, borde de bosque, pastizales y charrales, 1000–1200 m, 24 July 1995, *Isidro Chacón 279* (holotype, USJ; isotypes, CR, F, MO). Figure 1.

Dalechampia regnellii species brasiliensis affinis, a qua imprimis differt basi asymmetrici foliolorum lateralium, stipulis involucralibus 8–10 mm longis, bracteis involucralibus majoribus, sepalis pistillatis 12, ovario glabro, fructu majore.

Clambering vines, leafy stems 1–1.3 mm thick, with retrorse appressed hairs and spreading stinging bristles 1–1.5 mm long; stipules 8–10 mm long, 1.5–2 mm wide at the base, narrowly lanceolate, ciliate along the margin, with 6–7 ascending veins, persisting. Leaves 5-foliolate, petioles 3–10 cm long, ca. 1 mm thick with retrorse appressed hairs and spreading trichomes, stipels stipule-like; petiolules 3–10 mm long with antrorse appressed hairs; leaflets with blades 6.5–10.5 cm long, 2–2.5 cm wide, narrowly elliptic-oblong to narrowly ovate-elliptic, apex acuminate, margin with short teeth, lateral leaflets asymmetric at the base with a rounded-truncate side and a cuneate side, sparsely pilose on both surfaces, especially on the veins beneath; venation pinnate with 7–8 pairs of major secondary veins. Inflorescence axillary, solitary on axillary short-shoots 4–7 cm long; short-shoots with retrorse appressed hairs and 1–3 reduced leaves, involucral stipules 8–10 mm long, 1.5–2 mm wide at the base, narrowly lanceolate, pilose along the margin, with 6–7 ascending veins; involucral bracts 4–5.5 cm long, 3–3.5 cm wide, ovate and 5-lobed, yellowish green, with 7–9 major veins from base, the veins sparsely ciliate outside and strigillose with short appressed hairs on the inner surface, the margin ciliate and with short teeth. Staminate cymules pedunculate, peduncules 3–5 mm long, flattened, sparsely pubescent, involucel cupuliform, 2.5–4 mm long, 6–8 mm wide, with the bracts completely connate; pedicels 3–6 mm long; resiniferous bractlets laminar, margins entire, secreting sticky whitish resin; staminate flowers 8–9; bud oblong-elliptic, 2 mm long, 1–1.2 mm broad, acute at tip; calyx lobes 4, becoming reflexed, staminal column 2 mm long, glabrescent, anthers ca. 12, crowded, subsessile, 0.8 mm long, bilocular and dehiscent longitudinally. Pistillate cymules sessile, involucel of 2 bractlets; bractlets glabrous, margins sinuate, densely ciliate with hairs to 1 mm long; pistillate flowers 3, very short-pedunculate at anthesis; peduncles ca. 1 mm long; sepals 12, 3–4.5 mm long, 1–1.5 mm broad, bipinnatifid, margins hispid; ovary ca. 2 mm high, 1.5 mm thick, glabrous, 3-locular; stylar column straight, terete, 12–15 mm long, 0.5 mm thick, glabrous, cream-colored, tip slightly dilated and sometimes slightly downturned. Central fruiting-pedicel 2–2.5 cm long, laterals 10–12 mm long; fruiting sepals 12–16 mm long, margins, tentacular processes, and midstrip copiously beset with straight, sharp bristles 1–2 mm long. Capsule 12–14 mm diam., glabrous; columella 12–15 mm long, persisting; seeds globose, ca. 4 mm diam., rugose-verrucate, whitish, pale-red tinged.

This new species is named in honor of William C. Burger, long-time friend and devoted student of

Figure 1. *Dalechampia burgeriana* Gómez-Laurito (*I. Chacón 279*). —A. Habit. —B. Inflorescence at anthesis. —C. Staminate and pistillate cymules.

Costa Rican plants. His contributions to our knowledge of the Costa Rican flora have already been significant through his *Flora Costaricensis* publications.

Dalechampia burgeriana, with its 5-foliolate leaves, involucel of completely connate bracts, and resiniferous bractlets of staminate pleiochasium with entire margins belongs to section *Dalechampia* subsect. *Triphyllae* as delimited by Webster and Armbruster (1991). *Dalechampia burgeriana* may be related to *D. regnellii* Mueller-Argoviensis, another species with 5-foliolate leaves, from southern

Brazil (Pax & Hoffmann, 1919; Webster & Armbruster, 1991). However, *D. burgeriana* differs from *D. regnellii* in having lateral leaflets asymmetric at the base, involucral stipules only 8–10 mm long, stipels similar to the stipules, involucral bracts 4–4.5 cm long, pistillate flowers with 12 sepals, glabrous ovary, and capsule 12–14 mm in diameter vs. lateral leaflets cuneate at base, involucral stipules 25 mm long, stipels reduced or subulate, involucral bracts 2.5 cm long, pistillate flowers with 10 sepals, pubescent ovary, and capsule 8 mm in diameter in *D. regnellii*. *Dalechampia burgeriana* is known only from the type locality, at the edge of premontane forest, in the subtropical, tropical very wet biotic unit with 1–2 dry months, according to Herrera and Gómez (1993).

Acknowledgments. I thank Michael H. Grayum (MO) and an anonymous reviewer for critically reviewing the manuscript and Carmen Marín for the illustration.

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A New Species of *Aristolochia* (Aristolochiaceae) from Bahia, Brazil

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ABSTRACT. *Aristolochia longispathulata*, a new species from the "Mata Atlântica," is described and illustrated. The new species belongs to *Aristolochia* subser. *Hexandrae* F. González. It is easily recognized by flowers that are slightly curved and have a long, spatulate, fimbriate limb, which is pale green on the inner surface. *Aristolochia longispathulata* is similar to *A. arcuata* and *A. rumicifolia*, from eastern and southeastern Brazil. Its floral morphology also resembles that of *A. peltata*, from the West Indies, and *A. sessilifolia*, from southern Brazil, Argentina, and Uruguay.

RESUMO. Neste trabalho uma nova especie de Aristolochiaceae da *Mata Atlântica*, Bahia, Brasil, *A. longispathulata*, é descrita e illustrada. Esta espécie pertence a *Aristolochia* subser. *Hexandrae* F. González. E facilmente reconhecida por apresentar suas flores levemente curvadas, com o limbo longo, espatulado e fimbriado, além de possuir a face adaxial atipicamente alvo-esverdeada. *Aristolochia longispathulata* é semelhante a *A. arcuata* e *A. rumicifolia*, espécies da região oriental e sul-oriental do Brasil, embora a morfologia floral desta espécie assemelha-se a de *A. peltata*, das Indias Ocidentais, ou da espécie *A. sessilifolia*, do sul do Brasil, Argentina e Uruguai.

Although primarily pantropical, the genus *Aristolochia* (Aristolochiaceae) is more highly diverse in the Neotropics, especially in Brazil and Hispaniola. Following the description of several new species by Martius and Zuccarini (1824), the genus *Aristolochia* in Brazil has been reviewed by Masters (1875), Malme (1904), Schmidt (1935, 1936, 1938), Hoehne (1925, 1927, 1942, among others), and Bazzolo and Pfeifer (1977). Hoehne's (1942) comprehensive treatment lists some 75 species as native to Brazil. Since then, several local floras have included treatments of Aristolochiaceae (Ahumada, 1975; Capellari, 1996; Moore, 1915).

A new collection of *Aristolochia* from Bahía, Brazil, has come to my attention because of its long, spatulate, fimbriate flowers (Fig. 1). This collection does not match any species known to occur in northeastern or eastern South America (see Ahumada, 1967, 1975, 1977, 1979, 1989; Feuillet & Poncy, 1998; Hauman, 1923; Hoehne, 1927, 1942; Masters, 1875; Moore, 1915). There is some resemblance with *A. rumicifolia* Martius & Zuccarini (see Martius & Zuccarini, 1824, tab. 54), from the states of São Paulo and Rio de Janeiro, and *A. arcuata* Masters (Fig. 2), from the states of Minas Gerais, São Paulo, and Rio de Janeiro. However, the last two species differ from the Bahian collection in several important diagnostic characters (Table 1), such as the shape and size of the leaves, the length of the peduncle and ovary, and the overall shape of the perianth. The discovery of a new *Aristolochia* species comes as no surprise as the area of Bahia is well known for endemism not only for plants but also for various groups of animals (see, e.g., Mori et al., 1983). Unfortunately, only a few patches of undisturbed forest remain in that area, which may be the reason for having no other specimens of this new species besides the type collection.

Aristolochia longispathulata F. González, sp. nov. TYPE: Brazil. Bahia: Jussari, Serra do Teimoso, 7.5 km N of Jussari on road to Palmira, then 2 km W to Fazenda Teimoso, then 45 min. walk W to Reserva da Fazenda Teimoso, 15°10′S, 39°35′W, 300–450 m, 8 Feb. 1998 (fl), *W. W. Thomas, A. M. Amorim & J. L. Paixao 11741* (holotype, CEPEC; isotype, NY). Figure 1.

Aristolochia arcuata et *A. rumicifolia* affinis, a qua imprimis differt perianthio subrecto, usque 9.5 cm longo, limbo spatulato longiore usque 7 cm longo, fimbriato, pagina interna viridi-glauca.

Glabrescent vine. Petioles to 2.5 cm long; blades narrowly ovate, 8–16 cm long, 3–4.5 cm wide, membranaceous, smooth, base slightly cordate, sinus 5–10 mm deep, lobes parallel, apex obtuse, glabrous and with small white, siliceous bodies above, pale green and puberulous especially along the veins below; venation acrodromous, basal primary veins 3, prominent on the lower side, higher order venation densely reticulate, prominulous on

2

1

Table 1. Comparison of diagnostic features of *Aristolochia longispathulata*, *A. arcuata*, and *A. rumicifolia*.

	A. longispathulata	*A. arcuata*	*A. rumicifolia*
Leaves	narrowly ovate, with 3 basal veins	ovate, subhastate, with 5 to 7 basal veins	narrowly ovate, with 3 basal veins
Length of petiole	to 2.5 cm	to 4 cm	to 4 cm
Length of peduncle and ovary	to 5 cm	to 4 cm	to 2.5 cm
Shape of perianth	nearly straight	strongly reflexed	nearly straight
Total length of perianth	to 9.5 cm	to 5 cm	to 4 cm
Shape of utricle	ellipsoidal	obovoid	ellipsoidal
Shape of perianthial limb	very narrowly oblong, spatulate	oblong to obovate	narrowly obovate
Length of limb	to 7 cm	to 3.5 cm	to 2.5 cm
Apex of limb	obtuse	obtuse	emarginate
Surface of limb	fimbriate and with conical trichomes	fimbriate	glabrous

the lower side. Pseudostipules absent. Flowers axillary, solitary. Peduncle and ovary to 5 cm long, glabrescent. Perianth very slightly curved, puberulous and with small yellowish dots (*in siccus*) on the outside; utricle widely oblong, ovate, to 5.5 mm long, 2.5–3 mm diam., whitish, base symmetric, slightly constricted; syrinx present, inequilateral, ca. 1 mm long; tube slightly enlarged distally, to 1.5 cm long, ca. 1.5 mm in proximal diam., 3–3.5 mm in distal diam., forming an angle of ca. 180° with the utricle, deep purple outside; limb very narrowly oblong, forming an angle of ca. 180° with the tube, to 7 cm long and 9 mm wide (12 mm on the spatulate part), pale green on the inner surface and the margins, deep maroon on the outer surface, with the ¼ distal portion spatulate and fimbriate especially along the margins, apex round, fimbriae vascularized, to 4 mm long, conical trichomes present on the ¾ of the inner surface. Gynostemium stipitate, stipe ca. 1.4 mm long; anthers six, narrowly oblong, ca. 1.6 mm long, stigmatic lobes six, ca. 1.5 mm long. Capsule and seeds unknown.

Aristolochia longispathulata is known only from the type specimen, collected in a semi-deciduous forest, which suggests that the species is very uncommon. The new species belongs to *Aristolochia* subser. *Hexandrae*, one of the three infrageneric taxa proposed for the neotropical species by González (1990, 1991). The species of this subseries are easily distinguishable as they all have solitary, ebracteolate flowers along leafy branches, and both the petiole and the floral peduncle lack a basal abscission zone. This is the only species of subseries *Hexandrae* known to occur in the Mata Atlântica with long, straight, spatulate flowers, hence the epithet "longispathulata." Within *Aristolochia* subser. *Hexandrae*, the new species is closely related to *A. arcuata* and *A. rumicifolia*. However, the new species differs in several diagnostic characters, such as the narrowly ovate shape of the leaf blade, the short petiole and the long floral peduncle, and especially the conspicuously spatulate and fimbriate perianth, which is at least twice longer than in the other two species (Table 1).

The long, spatulate perianth of *Aristolochia longispathulata* is remarkably convergent with that of *A. peltata* L. (see Jacquin, 1764, tab. 4) from Cuba, Haiti, and St. Thomas, and of *A. brevifolia* (Chamisso) Hauman and *A. sessilifolia* (Klotzsch) Malme (see Ahumada, 1967, 1975; Hauman, 1923; Hoehne, 1927, 1942; Malme, 1904) from southern Brazil, Argentina, and Uruguay. In addition to the disjunct distributions, these three species strongly differ from *A. longispathulata* in various vegetative traits, such as the length of the petiole, the shape of the leaves, and the pubescence on various parts of the plant. Whereas *A. brevifolia* and *A. sessilifolia* are both densely puberulous and have extremely short petioles and leaves with truncate bases, *A. peltata* has ovate to widely ovate and subhastate leaves.

←

Figures 1, 2. —1. *Aristolochia longispathulata* F. González in field habit (*Thomas et al. 11741*). Note eggs of swallowtail butterfly on lower left of peduncle. Photograph by W. Thomas. —2. *Aristolochia arcuata* F. González (Royal Botanic Gardens, Kew, acc. 1982–8012). Photograph by F. González.

It is very likely that *Aristolochia longispathulata* is host to at least one species of *Battus*, a swallowtail butterfly. The type specimen bears the typical yellowish, round, gregarious eggs of this genus (Fig. 1; see also DeVries, 1987; Tyler et al., 1992), and some leaves display signs of herbivory.

Acknowledgments. I am grateful to Colciencias and the National University, Santafé de Bogotá, Colombia, and to The New York Botanical Garden, for financial and logistic support to continue my studies on the systematics of *Aristolochia*. A. Litt (NY), R. Cranfill (University of California), and an anonymous reviewer kindly reviewed the manuscript. I thank W. Wayt Thomas (NY) for providing the specimen and the photograph of the new species and the curator of CEPEC for the loan of the holotype. I also thank Genise Vieira Freire for translating the abstract into Portuguese.

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New Taxa, Names, and Combinations in *Saxifraga* (Saxifragaceae) for the *Flora of China*

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ABSTRACT. The following new species, new variety, new name, and four new combinations are published for the forthcoming account of *Saxifraga* L. in the *Flora of China*, Volume 8: *S. epiphylla* Gornall & H. Ohba, sp. nov., *S. gemmigera* Engler var. *gemmuligera* (Engler) J. T. Pan & Gornall, comb. nov., *S. heterotricha* Marquand & Airy-Shaw var. *anadena* (H. Smith) J. T. Pan & Gornall, comb. et stat. nov., *S. hypericoides* Franchet var. *aurantiascens* (Engler & Irmscher) J. T. Pan & Gornall, comb. nov., *S. hypericoides* var. *rockii* (Mattfeld) J. T. Pan & Gornall, comb. et stat. nov., *S. sinomontana* J. T. Pan & Gornall, nom. nov., and *S. sinomontana* var. *amabilis* H. Smith ex J. T. Pan, var. nov. In addition, the names *S. mengtzeana* Engler & Irmscher and *S. mengtzeana* var. *cordatifolia* Engler & Irmscher are lectotypified here.

The following new species, new variety, new name, and four new combinations are required for the forthcoming account of *Saxifraga* L. (Pan et al., in press) in the *Flora of China*, Volume 8.

Saxifraga epiphylla Gornall & H. Ohba, sp. nov. TYPE: China. Yunnan: Malipo Xian, "Pan-chia-chu," 1500–1700 m, 31 Oct. 1947, *K. M. Feng 12638* (holotype, A).

Species haec a *Saxifraga mengzteana* Engler & Irmscher differt sinu basalium foliorum embryonibus foliaceis instructis.

Saxifraga epiphylla and *S. mengtzeana* Engler & Irmscher (1913: 36) are similar species sharing the following features: stolons absent; stem usually simple; basal leaf blades ovate, rarely reniform, hairy and spotted at least abaxially, base cordate; cauline leaves few, lanceolate to ovate; flowers zygomorphic, disc obscure; filaments clavate. However, *S. epiphylla* differs from *S. mengtzeana* chiefly in that it produces a foliar embryo in the sinus of the basal leaf blades. The new species also has basal leaf blades glandular hispid on both surfaces, whereas *S. mengtzeana* has blades glabrous adaxially.

In Pan (1992: 74–75, pl. 14), the name *Saxifraga aculeata* I. B. Balfour (1916: 70) was misapplied to the species here described as *S. epiphylla*. However, the holotype of *S. aculeata*, *A. Henry 10316B* (E), which lacks foliar embryos, is also an isosyntype of *S. mengtzeana* var. *cordatifolia* Engler & Irmscher (1913: 37), a taxon that we regard as synonymous with *S. mengtzeana* var. *mengtzeana* (see below). Indeed, there is no reference to foliar embryos in any of the protologues. The taxon with foliar embryos therefore constitutes a new species, which we here formally describe as *S. epiphylla*, the epithet referring to the position of foliar embryos.

In their protologue for *Saxifraga mengtzeana*, Engler and Irmscher divided the species into two varieties: var. *cordatifolia* and var. *peltifolia* Engler & Irmscher (1913: 37). They did not cite an autonym, such as a variety "*typica*," which was their usual procedure, e.g., in their monograph of *Saxifraga* (Engler & Irmscher, 1916, 1919). Three specimens were cited under *S. mengtzeana*: two under variety *cordatifolia* (*A. Henry 10316* and *A. Henry 10316B*, syntypes both at B) and the third under variety *peltifolia* (*A. Henry 9118*, holotype at B). No specimens were cited under the species before the two varieties. We regard variety *cordatifolia* as constituting the type variety (autonym) because it is cited first in sequence (as "1. Var. *cordatifolia*"). In the accounts of polymorphic species in their monograph of the genus, Engler and Irmscher (1916, 1919) almost invariably treated the type variety first, usually as "var. α. *typica*." We can infer

that in this particular case the authors wanted to make a nomenclatural contrast between the common plant, with ovate-cordate leaves, and the less common variant, with peltate leaves. To clarify this taxonomic ambiguity, we are lectotypifying both *S. mengtzeana* and its variety *cordatifolia* on the same specimen. The three specimens at B have not been seen and are probably destroyed. Given this, we here designate as the lectotype of *S. mengtzeana* and *S. mengtzeana* var. *cordatifolia* an extant isosyntype, *Henry 10316B* (E). This specimen is also the holotype of the later name *S. aculeata*, which now becomes a nomenclatural synonym of *S. mengtzeana* and a superfluous name. However, *S. aculeata* remains legitimate because it was not nomenclaturally superfluous when first published (*Saint Louis Code*, Art. 52 Note 2, Greuter et al., 2000).

Finally, it is worth pointing out that the holotype of *Saxifraga mengtzeana* var. *peltifolia* (*A. Henry 9118*, at B) is (or was) part of the same gathering as the holotype (at E) of *S. henryi* I. B. Balfour (1916: 72). To our knowledge there are no problems surrounding the application of these names, other than the question of whether the peltate-leaved variant is worth recognizing as distinct from *S. mengtzeana*.

Saxifraga gemmigera Engler var. **gemmuligera** (Engler) J. T. Pan & Gornall, comb. nov. Basionym: *Saxifraga unguiculata* Engler var. *gemmuligera* Engler, in Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 29: 116. 1883. TYPE: China. Gansu: "in jugo septentrionem versus a flumine Tetung, altissima regione alpina," 1872, *N. M. Przewalski* (syntype, LE not seen; isosyntype, B not seen, ?destroyed); "in regione alpina pr. alpem Dshachar-dsargyn," 3500–3800 m, 1880, *N. M. Przewalski* (syntype, LE not seen; isosyntype, B not seen, ?destroyed).

Engler and Irmscher (1916: 141, 150–151) distinguished *Saxifraga gemmigera* from *S. gemmuligera* (Engler) Engler & Irmscher on the grounds that the former, which occurs in Shaanxi Province, has linear cauline leaves, whereas the latter, which occurs in Gansu, Qinghai, and Sichuan provinces, has oblong to subovate-oblong, median and distal cauline leaves. Although this is true, the variation is such that we can find no discontinuity worthy of specific separation. We therefore propose to treat the taxa as varieties, representing the two ends of a morphological continuum.

Engler and Irmscher (1912: 601) commented on the identity of the two syntypes of *Saxifraga unguiculata* var. *gemmuligera* at LE. They explicitly identified as *S. gemmuligera* the Przewalski specimen of 1872 (which they dated as July and numbered as 221) and as *S. unguiculata* sensu stricto the Przewalski specimen of 1880 (which they dated as June and numbered as 360). Formal lectotypification will have to await study of both syntypes at LE.

It should be noted that the name *Saxifraga gemmifera* Persoon (Syn. Pl. 1: 490. 1805), whose epithet some might think is sufficiently similar to *S. gemmigera* as to constitute an earlier homonym under Article 53.3 of the *Saint Louis Code* (Greuter et al., 2000), is invalid under Article 34.1(c) (i.e., it was published as a synonym) and consequently has no nomenclatural status.

Saxifraga heterotricha Marquand & Airy-Shaw var. **anadena** (H. Smith) J. T. Pan & Gornall, comb. et stat. nov. Basionym: *Saxifraga anadena* H. Smith, Bull. Brit. Mus. (Nat. Hist.), Bot. 2: 258, f. 17e–h. 1960. TYPE: China. Xizang: "Kongbo [Gongbo], Ba La, Pasum Chu," 4350 m, 29 June 1947, *Ludlow, Sherriff & Elliot 14033a* (holotype, BM; isotype, A).

This taxon is identical to *Saxifraga heterotricha* in every way except that the stem and cauline leaf margin have eglandular rather than glandular hairs.

Saxifraga hypericoides Franchet var. **aurantiascens** (Engler & Irmscher) J. T. Pan & Gornall, comb. nov. Basionym: *Saxifraga macrostigma* Franchet var. *aurantiascens* Engler & Irmscher, Notes Roy. Bot. Gard. Edinburgh 5: 132. 1912. TYPE: China. Yunnan: "eastern flank of the Lichiang [Lijiang] Range. Lat. 27° 20′ N. Alt. 10,500–11,000 ft.," Sep. 1906, *G. Forrest 2947* (syntype, E; isosyntype K); same locality but "Lat. 27° 30′ N. Alt. 14–15,000 ft.," July 1910, *G. Forrest 6221A* [mixed with *S. aristulata* var. *longipila* (Engler & Irmscher) J. T. Pan] (syntype, E; isosyntypes, BM, E); same locality but "Lat. 27° 35′ N. Alt. 14,000 ft.," Sep 1910, *G. Forrest 6636B* (syntype, E).

The variety *aurantiascens* agrees in its vegetative morphology with *Saxifraga hypericoides* rather than with *S. aristulata* (including *S. macrostigma*), particularly in having adaxially pubescent leaves (rather than glabrous ones as in *S. aristulata*). *Saxifraga hypericoides* var. *aurantiascens* is distinguished from variety *hypericoides* chiefly in having a solitary flower.

Saxifraga hypericoides Franchet var. **rockii** (Mattfeld) J. T. Pan & Gornall, comb. et stat. nov. Basionym: *Saxifraga rockii* Mattfeld, Notizbl. Bot. Gart. Berlin-Dahlem 11: 302. 1931, non *S. rockii* Irmscher, Notes Roy. Bot. Gard. Edinburgh 18: 267. 1935 [= *Saxifraga eglandulosa* Engler]. TYPE: China. Sichuan: "Mount Konka [Gongga Shan], Risonquemba, Konkaling," 4400 m, June–Aug. 1928, *J. F. Rock 16872* (holotype, B not seen, ?destroyed; isotypes, E, GH, K).

Rock's plant differs from variety *hypericoides* in having petals that are rounded or cuneate at the base, rather than cordate at the base.

Saxifraga sinomontana J. T. Pan & Gornall, nom. nov. Replaced synonym: *Saxifraga montana* H. Smith, Acta Horti Gothob. 1: 9, f. 2e, f, t. 6 [upper 2 plants]. 1924, non *S. montana* (Small) Fedde, Just's Bot. Jahresber. 33(1): 613. 1906 [based on *Micranthes montana* Small, in Small & Rydberg, N. Amer. Fl. 22: 138. 1905]. TYPE: China. Sichuan: "Mountains E of Matang," ca. 4800 m, s.d., *H. Smith 4414* (lectotype designated by Ohba et al. (1995: 230), UPS not seen; isolectotype, BM).

This new name is needed because *Saxifraga montana* H. Smith is a later homonym of *S. montana* (Small) Fedde, a validly published combination based on *Micranthes montana* Small, described from California, U.S.A. We are grateful to James L. Zarucchi (MO) for drawing this problem to our attention and for suggesting the replacement name, which we think is most apposite.

Saxifraga sinomontana J. T. Pan & Gornall var. **amabilis** H. Smith ex J. T. Pan, var. nov. TYPE: China. Sichuan: "Taofu distr. [Dawu Xian], montes orient.: Lhamo Mondeh La, in rupibus calcareis, 4500–4700 m," 21 Sep. 1934, *H. Smith 12278* (holotype, BM).

Varietas haec a var. *sinomontana* differt paginis foliorum basalium pilis rufescentibus crispulis instructis.

This variety differs from the polymorphic *Saxifraga sinomontana* var. *sinomontana* in having crisped, rufous, eglandular hairs on the adaxial surface of the basal leaves. This taxon was recognized at the rank of species by Smith (in sched., *H. Smith 11262* and *H. Smith 12278*, both at BM), but the name was never published.

Acknowledgment. We thank Nicholas J. Turland (MO) for much help in preparing the manuscript.

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A New Species of *Dioscorea* from Costa Rica

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ABSTRACT. *Dioscorea natalia* (Dioscoreaceae) is described from wet to very wet areas on both Pacific and Caribbean slopes of Costa Rica, from the Monteverde area to Tapantí National Park. The species' confusion with the related *D. lepida* C. V. Morton is discussed, and a key is provided to distinguish it from that species and the other two closely related Costa Rican species, *D. racemosa* (Klotzsch) Uline and *D. standlyei* C. V. Morton.

During the course of work on a treatment of *Dioscorea* for the *Manual de Plantas de Costa Rica*, material of three possible new species was set aside for further study. Careful examination and review demonstrated that one of them would not be separated from the recently described Panamanian *D. davidsei* O. Téllez, and that the other corresponds to *D. lepida*. The third, here described as *D. natalia*, had previously been identified as *D. lepida* and with that species, is closely related to two other Costa Rican species, *D. racemosa* and *D. standleyi*.

Dioscorea natalia Hammel, sp. nov. TYPE: Costa Rica. Cartago: Parque Nacional Tapantí, Sendero Oropendula, 1400 m, 26 Sep. 1997 (stam. & pist. fl, fr), *B. Hammel & S. Troyo 21068* (holotype, INB; isotypes, CR, F, MEXU, MO). Figure 1.

Species subtilis *D. racemosae* affinis, a qua imprimis differt inflorescentiis brevioribus, paucior-floribus rachidibus exilioribus.

Stems delicate, twisting to the right but also very rarely to the left. Leaves alternate, ovate to narrowly triangular-cordate, 4.5–6(–9.5) × 2.5–3.5(–5) cm, 7(9)-nerved, glabrous, very faintly glandular-dotted on the lower surface. Staminate inflorescences 4–8(–10) cm, simple racemes to racemose, usually 1 to rarely as many as 5 per axil; the rachis ± verruculose, very delicate, up to only twice the diameter of the pedicels; the cymes of 1 (rarely 2) flowers, subtended by a pair of narrowly triangular bracts 1–1.5 mm; pedicels 1.5–2(–4) mm. Staminate flowers with tepals appearing nearly valvate in bud, broadly triangular, 0.8–1.1 mm, patent, pale yellowish green or cream; stamens 3, connivent in the center of a ± hexagonal torus; filaments ca. 0.1–0.15 mm, united only at the very base; anther cells ± ovoid, ca. 0.15–0.2 mm, touching those of adjacent anthers, dehiscing upward; staminodia none. Pistillate inflorescences 5–8 cm, spikes. Pistillate flowers with tepals as in the staminate ones but to 1.25 mm; styles 3, united in a conical stylar column 0–0.25 mm, the free portion, including stigmas, ca. 0.4 mm; stigmas 3, simple; staminodia lacking. Fruits perpendicular to the rachis, elliptic, 1.2–2.0 × 0.5–0.9 cm, apically acute; seeds 1–1.4 × 0.3–0.4 cm, winged on the posterior end.

Paratypes. COSTA RICA. **Alajuela:** Reserva Forestal San Ramón, 1100 m, Apr. 1991 (fl), *Bittner 972* (CR); between San Miguel and La Palma de San Ramón, Nov. 1926, *Brenes (278) 5124* (CR); Monteverde Reserve, Río Peñas Blancas, 900 m, Aug. 1988 (fl), *Bello 248* (CR). **Guanacaste:** Monteverde, 1 km al N de Las Nubes, 1300 m, Sep. 1988 (stam., pist. fl, fr), *Haber & Zuchowski 8675* (INB, MO); road to Las Nubes, 1400 m, Nov. 1988 (stam., pist. fl), *Haber 8749* (INB). **Puntarenas:** Monteverde Reserve, 1 km SW of Station, 1500 m, Feb. 1992 (fl), *Ingram & Ferrell 1298* (CR); Monteverde vicinity, Upper Río Negro valley, 1500 m, Sep. 1985 (fl, fr), *Haber ex Bello 3020* (CR); Monteverde vicinity, San Gerardo Biological Station, 1200 m, Feb. 1995 (pist. fl, fr), *Penneys 167* (CR, F, INB, MO, US). **San Jose:** Río Hondura, 1100 m, Feb. 1974 (fl), *Lent 3791* (CR). **Cartago:** Cañón del Río Grande de Orosí, Oct. 1983 (fl, fr), *Chacón et al. 1483* (CR—6 mounted duplicates); Parque (Refugio) Nacional Tapantí, 1250 m, Aug. 1991 (stam. fl), *Hammel et al. 18324* (INB, MO); 1400 m, Dec. 1992 (fl), *Herrera 5813* (CR), June 1994 (stam. fl), *Morales & Carnevali 2873* (INB); Valle del Reventazón, Moravia de Chirripó, 1100 m, Sep. 1993 (stam. fl), *Campos & Campos 186* (INB).

Distribution. This species, apparently endemic to Costa Rica, is known from some of the very wettest parts of the country, especially P. N. Tapantí. However, it is also known from the Las Nubes area of Monteverde, which is relatively dry. So far it is known only from 900–1500 m, from Monteverde and Tapantí, and several intervening localities.

Etymology. It was my pleasure to defer to Silvia Troyo, illustrator of this new species, the honor of choosing its name. When she came across the species for the first time in the field, she was struck by the same joy of discovery as any taxonomist upon finding such a new species, so tiny and precious. For all good reason, she chose the name Natalia, one often given here to first-born daughters, and that of her own. The epithet "natalia" is used

Figure 1. *Dioscorea natalia* Hammel. —A. Habit, staminate branch. —B. Habit, pistillate branches. —C. Staminate flowers. —D. Pistillate flower. —E. Seed. Drawn from the type specimen.

intentionally as a word in apposition with no Latin termination as sanctioned by the Saint Louis Code, Article 23.1 (Greuter et al., 2000), and therefore not to be corrected (Art. 60.11) by well-meaning Latinists.

Discussion. *Dioscorea natalia* is distinct from the closely related Costa Rican species (*D. lepida*, *D. racemosa*, *D. standleyi*) by its consistently very small leaves and small, delicate inflorescences whose slender rachis is usually less than twice the diameter of the pedicels. The flowers are almost always solitary along the rachis, and are borne on rather long pedicels up to 4 mm. Some specimens of *D. racemosa* have nearly identical, also solitary flowers. However, the leaves are much larger, the inflorescences longer and thicker, and the flowers are more densely clustered. Although specimens of this species, examined for *Flora Mesoamericana*, were originally identified as *D. lepida*, the two are easy to distinguish: *D. lepida* always has much larger leaves, much-branched staminate inflorescences, and more or less ligulate, rather than broadly triangular, tepals.

Since *D. natalia* had originally been determined as *D. lepida*, a discussion concerning our understanding of the latter is in order. Partly because the original description was based only on fruiting material (Morton, 1936), *D. lepida* has often been wrongly identified and poorly characterized (cf. Morton, 1945; Standley, 1937). Early in my study of the Costa Rican *Dioscorea* I had considered this material to be a new species distinct from related species by virtue of its abundantly branched staminate inflorescences, and very broadly cordate, many-veined, and often opposite leaves. None of these features was mentioned in the original description of *D. lepida*, nor used to distinguish it in intervening floristic treatments. The one feature, visible in the type, that taxonomists have used to form an (erroneous) concept of this species is the apically acute fruits (cf. Téllez & Schubert, 1994). It is now known that material grouped by that character alone can include several species: *D. lepida*, *D. natalia*, *D. racemosa*, and *D. standleyi* all have rather small, often or always apically acute fruits. If one additional character should be chosen as that which allowed a clear delimitation of *D. lepida*, it would be the position of the mature fruits, i.e., reflexed (see key) by the pedicels toward the base of the infructescence so that they lie nearly parallel to the rachis. This is consistent in all fruiting collections and all observed populations of *D. lepida*, and contrasts with the more or less perpendicular or even apically directed fruits of the related species here discussed. That, in conjunction with the narrowly acute fruits, much-branched staminate inflorescences, broad, many-veined, and often opposite or even ternate leaves (at lower nodes), as well as the rather high and narrow elevational range, help distinguish *D. lepida* from its close relatives in Costa Rica.

In addition, *D. lepida* is unusual in that plants of all populations examined were monoecious instead of dioecious, as most species of *Dioscorea* are considered to be. *Dioscorea lepida* stems apparently die back during the dry season, and the new shoots, appearing at the beginning of the rainy season, flower precociously with staminate flowers. As the stems elongate they begin producing pistillate flowers toward the apex with a few intermediate inflorescences bearing both sexes and even some apparently hermaphroditic flowers. By the time the plants are in late flowering stage or fruiting, there may be little or no evidence of the staminate inflorescences lower down. Such a stituation can easily give rise to herbarium specimens that bear only one sex. Field or greenhouse observations of other species known only from collections might demonstrate monoecy to be more widespread in *Dioscorea* than previously thought.

KEY TO COSTA RICAN SPECIES CLOSELY RELATED TO *D. NATALIA*

The terminology used here, reflexed (downturned) versus upturned, relative to the axil, would be reversed relative to gravity since the infructescences are pendent in living plants.

1a. Staminate inflorescences paniculate (primary inflorescence axis branched), the branches racemes of flowers in cymose clusters; leaves usually opposite, sometimes alternate, rarely ternate at lower nodes, (9–)11–13(–15)-veined; plants monoecious; fruit pedicels strongly reflexed; stylar column ca. 0.4–0.5 mm long . . . . . *D. lepida*

1b. Staminate inflorescences racemose (primary inflorescence axis unbranched), the flowers solitary along the rachis or in cymose clusters; leaves alternate, 7–9-veined; plants typically dioecious; fruit pedicels mostly perpendicular to the axis, upturned, or occasionally slightly reflexed; stylar column mostly much longer or shorter than 0.4–0.5 mm.

2a. Filament column ca. 0.7 mm, the filaments apically (above the center) curved outward, the anthers separate; tepals ligulate; staminate flowers in cymose clusters; stylar column 0.8–1.1 mm . . . . . *D. standleyi*

2b. Filament column mostly < 0.25 mm, usually erect and the anthers connivent, occasionally separate; tepals mostly broadly triangular, rarely ligulate; staminate flowers often solitary; stylar column mostly 0–0.25 mm (rarely up to 0.5 mm in *D. racemosa*).

3a. Staminate inflorescences 4–8(–10) cm, solitary, the rachis slender, mostly less

than twice the diameter of the pedicels, sparsely flowered, the flowers solitary, pale green; leaves mostly 4.5–6 × 2.5–3.5 cm; infructescence with < 10 fruits; plants delicate . . . . . *D. natalia*

3b. Staminate inflorescences 9–32 cm, often several per axil, the rachis thick, ca. 4 times the diameter of the pedicels, densely flowered, the flowers often in cymose clusters, usually purple; leaves (7–)10–13(–23) × 4–9(–16) cm; infructescence often with > 20 fruits; plants usually robust . . . . . *D. racemosa*

Acknowledgments. This work was supported, in part, by funds from the National Science Foundation through a grant (DEB-9300814) to the author and co-PI M. H. Grayum for the Manual to the Plants of Costa Rica. I thank Osvaldo Téllez for his useful comments on an early draft of the manuscript and Sylvia Troyo for her excellent line drawings of the new species.

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Zea nicaraguensis (Poaceae), a New Teosinte from Pacific Coastal Nicaragua

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ABSTRACT. The geographically isolated annual teosinte from the coastal plain and embayments/estuaries near the Gulf of Fonseca, Nicaragua, is differentiated from *Zea luxurians* from southeastern Guatemala by its much longer and more abundant tassel branches, larger number of spikelets per branch, and longer, more pronouncedly transversely rugose outer glumes, as well as by its low-elevation coastal habitat. Molecular (ribosomal ITS) evidence and other data, placing it basal to *Z. luxurians*, seem to support this taxonomic segregation.

RESUMEN. El teosinte annual que crece en aislamiento geográfico en la planicie costera y los bajos inundados y esteros cerca del Golfo de Fonseca, Nicaragua, difiere de *Z. luxurians* del sureste de Guatemala por el número mayor de ramas y espiguillas por rama de la inflorescencia masculina, por la rugosidad transversal pronunciada de las glumas inferiores, además de altura baja de su hábitat costero. Evidencia molecular ubica a esta especie como más primitiva a la especie *Z. luxurians* y apoya a esta segregación taxonómica.

"There are very recent but as yet unverified reports of teosinte [in Honduras] from the mountains of the Department of Francisco Morázan, not far from Tegucigalpa, from the mountains of Copán, and even Nicaragua" (Standley, 1950: 61).

In November 1989, entomologist Allan H. Hruska, following up on a tip from Adrian Ramos, a fellow worker in the CARE Nicaragua maize improvement project, located a population of teosinte (a wild species of *Zea*) at Km 178 on the Chinandega–Somotillo highway in southwestern Nicaragua. Subsequently, ripe seeds were collected and, in 1990, sent to his mentor, Lowell ("Skip") R. Nault, eminent leafhopper taxonomist and maize virologist at the Ohio Agricultural Research and Development Center, Wooster, Ohio, who promptly sent two of these to Iltis at the University of Wisconsin-Madison. Iltis, in turn, after noting their resemblance to those of Guatemalan *Z. luxurians* (Durieu & Ascherson) Bird, forwarded the two seeds to John Doebley (then at the University of Minnesota) for preliminary analysis. This revealed great morphological similarity to, but also considerable differences in developmental behavior from, Guatemalan teosinte.

The general area of Hruska's 1989 discovery in southwest Nicaragua was visited by the authors on 5 October 1991. No teosinte was encountered there; however, repeated inquiry about the location of additional stands of "teosinto," the local name, hinted at by Hruska in a letter, led us several days later to the discovery of a small population some two hours by horse from Rancho Apacunca, some 19 km to the west of Hruska's site. Now evidently extremely local and rare, the teosinte at this location is remarkable for its ability to grow in as much as 0.4 m of standing or slowly moving water.

Zea nicaraguensis Iltis & Benz, sp. nov. TYPE: Nicaragua. Chinandega: Pacific coastal plain near Golfo de Fonseca, edge of now flooded [by mid-December, bone-dry] area between Estero Paimica and Estero Palo Blanco, at a place seasonally occupied by cattle herders known as El Rodeo (12°53′45″N, 86°59′W), ca. 4–5 km NNW of *Apacunca* (12°52′30″N, 86°57–58′ W), 18–20 km SW of *Villa Nueva*, alt. 9 m, 8 Oct. 1991, *H. H. Iltis, B. F. Benz & A. Grijalva 30831* (holotype, HNMN; isotypes, K, MEXU, MO, NY, US, WIS-2).

Topotypic paratype of same population, in ripe fruit, 18 Dec 1991, *H. H. Iltis, M. Castrillo, C. Medina & C. Aker 30919* (HNMN, WIS).

Similis *Zeae luxurianti*, sed robustior, culmis ad bases 3–5 cm diam., 2–4(–5) m altis, inflorescentiis masculinis robustioribus et 23–32 cm longis, cum 27–38 ramis, differt.

Maize-like erect annuals, unbranched to candelabra-branched, 2–4(–5) m tall (Fig. 1A), sometimes with 1 to 4 stout basal tillers (suckers), these to 2 m long in giant plants, with prominent prop roots (Fig. 1D). Male inflorescences (tassels) 23–32 cm long, with 27–38 slender branches (including infrequent secondary branches from the base of basal primary ones), the central one undifferentiated [all plants of the type not quite mature as of date of collection (8 Oct.), hence weak, with all the branches drooping downward together on one side] (Fig. 1B); branches each with ca. 36 to 64 sessile-pedicellate spikelet pairs, the outer glumes with two prominent keels that merge at the apex, ca. 9–11 mm long, strongly transverse rugulose especially when young (Fig. 1C); culms (tassel peduncles) immature in the type specimens, only ca. 3–6 cm long, but dramatically elongating to 25 cm or more by maturity; tassel branching axes variable, 8–12 cm long. Female spikes in sheathed complex clusters, 6–18 cm long, on peduncles of variable length, enclosed by glabrous, linear-lanceolate spathes, these 6–10 cm long; fruitcases ca. 4 to 10 per spike, trapezoidal appressed-cylindric, very smooth and shiny, ± uniformly colored a light to dark (coffee or earthen) brown, 7–10 mm on the long (glume) side, 3–6 mm on the short side, 4–6 mm diam. (Fig. 1C).

Flowering (tasseling) from mid-October to early November, with fruitcases mature in mid-December. Common name "Teosinto."

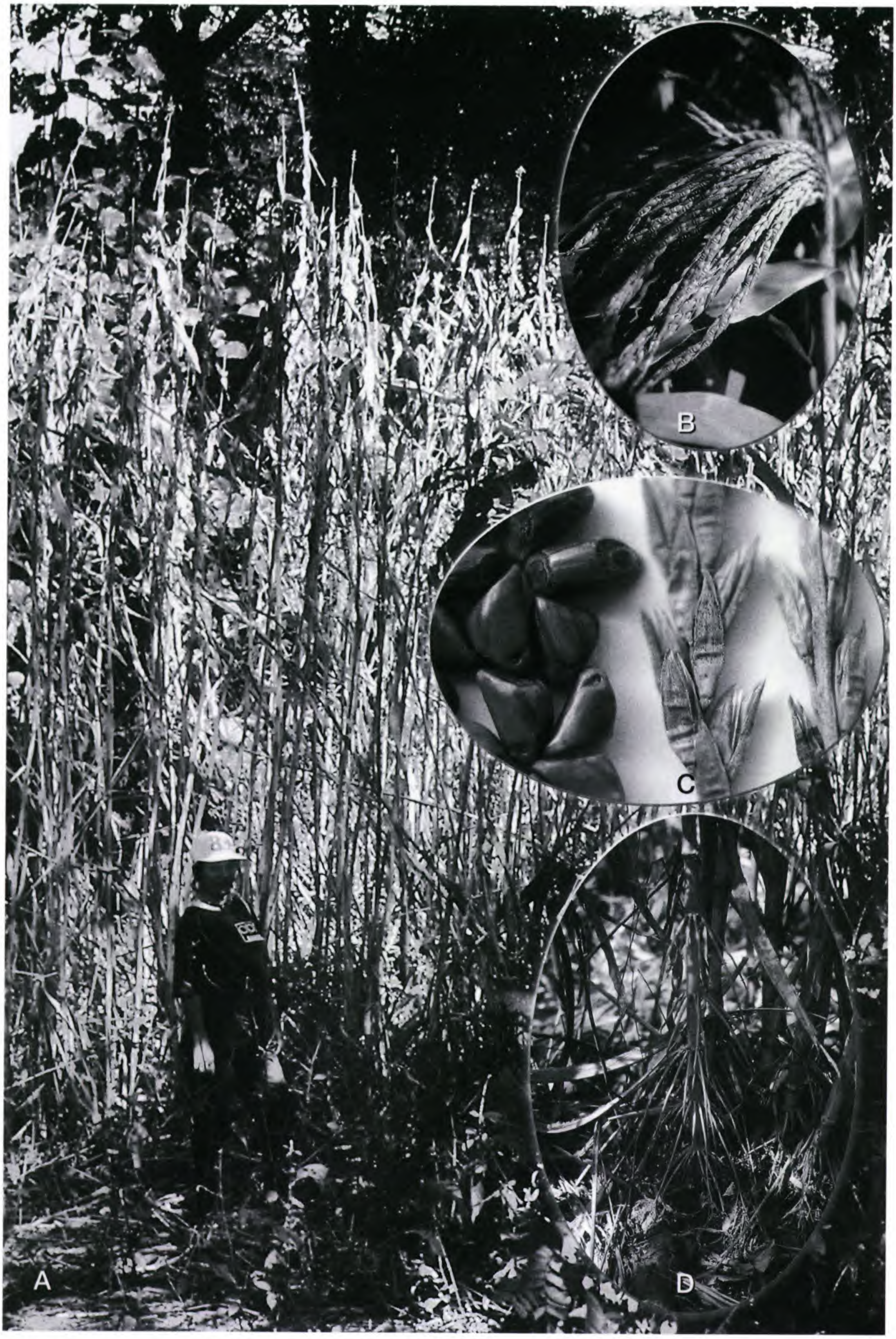
The still somewhat immature tassel of one of the two WIS isotypes (Fig. 1B), symbolized by the second highest filled circle on Figure 2, was used in 1992 for the University of Wisconsin Herbarium's traditional New Year's card, photocopied directly and unreduced from the specimen onto herbarium-size sheets and sent to over 400 herbaria, botanists, and friends all over the world.

Distribution, ecology, and habitat. (All locations on lower half of Nicaragua topographic sheet *Villa Nueva* 1:50,000, 1989): *Zea nicaraguensis* appears to be restricted to the Department of Chinandega, Nicaragua, in the lowlands of the Gulf of Fonseca that drain to the nearby Pacific Ocean, at elevations of 9 m (type collection) to 75 m (according to Hruska's seed collection, presumably from near Israel; see below). We were told by some local old *campesinos* that this very flat landscape was once covered mostly by savannas of *Crescentia*, with gallery forests only near the confluence and levees of seasonal streams.

(1) *The Apacunca (holotype) locality*: The nearby savannas had in the past often been cleared for agriculture, once for rice, then for pasture, and are now heavily grazed by cattle. At the October date of collection, this vast treeless plain was under 0.2–1.5 m of very slow-moving water but deceptively covered with a dense, lush, and green, rooted floating mat of mostly introduced Old World and some native New World grasses, such as *Brachiaria mutica* (Forsskål) Stapf, *Echinochloa polystachya* (HBK) Hitchcock, *E. pyramidalis* (Lamarck) Hitchcock & Chase, *Oryza latifolia* Desvaux, *Paspalum virgatum* L., and *Hymenachne amplexicaulis* (Rudge) Nees, as well as colonies of *Neptunia* sp., *Thalia geniculata* L., and *Echinodorus paniculatus* Micheli, the last two often locally dominant. The dense gallery forest, where the teosinte grew, was located on a slightly higher river levee, which formed somewhat of an island, where, inaccessible to cattle during flooding, the teosinte was thus protected especially in its early stages from grazing (Fig. 3). Teosinte, now rare, was reported by the old cowboys at Rancho Apacunca to have been "ubiquitous" here in the past.

With floodplain savanna on one side, and a seasonal flooding river (estero) on the other, the strip of gallery forest of *Ceiba pentandra* (L.) Gaertner, *Pithecellobium dulce* (Roxburgh) Bentham, *Enterolobium cyclocarpum* (Jacquin) Bentham, and *Bravaisia integerrima* (Sprengel) Standley had an understory of *Coccoloba* (2 spp.), *Bactris minor* Jacquin, *Cassia reticulata* L., *Caesalpinia* spp., and *Crescentia alata* HBK, and here, also, towering thickets of gigantic plants of teosinte. Growing both in shade and on the forest's sunny margins, their stems and prop roots were covered by shallow standing water 10–40 cm deep, this by 8 October beginning to recede (Fig. 1D). But only a very few of the several hundred teosinte plants were now starting to "shoot out" their male inflorescences, and, despite diligent searching, all we could find were nine somewhat immature tassels, which became the type collection (see Discussion).

(2) *The Cayanlipe locality* (for paratype and second population) lies in the flat, mostly treeless Comarca Cayanlipe 4 km south and east of the village of Cayanlipe in the Llano de Toreras and 7 km east-southeast of the Apacunca station. Although this area gets flooded as well as during the rainy season, the dirt road nearby is not elevated like the one leading to Rancho Apacunca, a circumstance that prevented us from visiting this teosinte population in October. *Zea* plants here are ca. 3.0–3.5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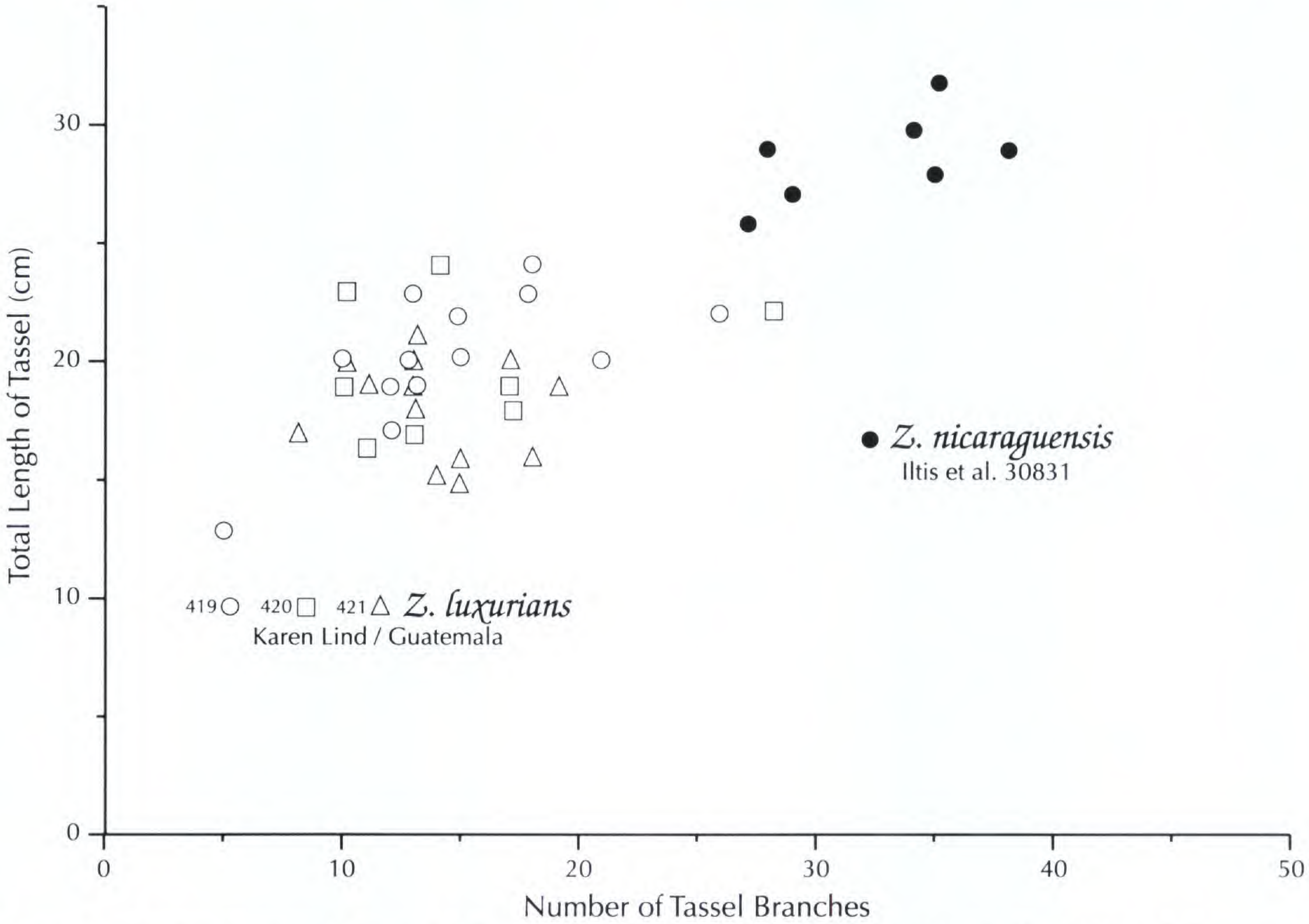

Figure 2. Scatter diagram of seven (of the eight) isotypes of *Z. nicaraguensis* (*Iltis et al. 30831*) and three mass collections of *Z. luxurians* [based on *K. Lind 419, 420,* and *421* from the vicinity of El Progreso, Dept. Jutiapa, Guatemala (location data in Doebley, 1983: 36; specimens in WIS)].

m tall, unbranched or some with long upper candelabra branches. A few had up to 4 basal shoots (tillers), and all were now past fruiting on 18 December, the date of collection, with their tassel branches mostly disarticulated. The now bone-dry savanna of jicaro, *Crescentia alata* HBK, and scattered *Guazuma ulmifolia* Lamarck was covered by solid stands of the African *Hyparrhenia rufa* (Nees) Stapf. At this location, the *Zea* population was marginalized to a dense, weedy, spiny thicket of *Byttneria aculeata* (Jacquin) Jacquin and *Acacia farnesiana* (L.) Willdenow, where, safe from cattle, it survives in a small colony of less than 20 individuals.

(3) *Israel, Nicaragua*: In 1991, A. H. Hruska wrote to L. R. Nault that he had located teosinte on 7 Nov. 1989 ". . .'in tassel'. . .at km 178 [from Managua] of the Chinandega–Somotillo highway at elevation of about 75 m, in dry jicaro (calabash) savanna forest on very heavy clay. . .. From all indication this is not a recently introduced population, for peasants around there say it's a well known plant, that has always been here. . .. There was lots more where this came from." (From copy of letter, in WIS!)

There is some question concerning the exact location of Hruska's population. Location Km 178 lies at an elevation of ca. 20 m, as is the land surrounding the village of Israel, which was not visited by us, hidden behind some hills 2 km from the highway to the southeast. We suspect that Hruska's teosinte came from the savanna-covered flatlands only 11–15 m in elevation, located 1–6 km south and east on the dirt road to Mina El Limon, espe-

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Figure 1. *Zea nicaraguensis* Iltis & Benz at the type locality (18 Dec. 1991). —A. Dense thicket of dry, overmature, mostly unbranched, 3–5 m tall plants, with tassels (0.2–0.4 m long) mostly disarticulated and missing. Cony Navaez, curator of UNAN-Leon Herbarium, standing. —B. Young tassel, with lax branches drooping over on one side, before elongation of the culm, i.e., the ultimate and often very long internode just beneath the tassel. (8 Oct. 1991). —C. Mature fruitcases and overmature tassel branches of A. —D. Prop roots of A. (A, C, D, *Iltis et al. 30919*; B, *Iltis et al. 30831.*)

cially in areas marked on the map as Llano El Coyol, Sitios de Algodon, and Laguna El Tule. While northeast of Israel the topographic map shows many scattered 20–40(–161) m high and very steep cliffs jutting out of the plain (and there was even one adjacent to the highway near Km 178, which we climbed), these, it would seem, would be unlikely habitats for *Zea nicaraguensis*. In any case, intensive fieldwork in this "botanically promised land" of Israel, Nicaragua, would be highly desirable.

There exists a herbarium specimen, collected on 19 September 1990, grown from Hruska's seeds (*Doebley 648*, MIN), the label data of which state that: "Plants grown in a growth chamber at the University of Minnesota, produced mature seeds four months after planting, this much more rapidly than is typical of . . . [*Zea luxurians*]. This collection, clearly differentiated from the Guatemalan form of this species by its small stature and early maturity, may represent a new subspecies." In addition, of course, it may simply show how enormously sensitive in their responses to moisture, daylength, and altitude annual teosinte plants can be. (See below; also Bird, 2000; Iltis, 1983, 1987, 2000.)

Paratypes. NICARAGUA. **Chinendaga:** Pacific coastal plain (planice costera) near Golfo de Fonseca, just S of Comarca Cayanlipe (a vast Sorghum-cultivated, treeless plain) at a place locally called "La Tronconado," 3 km S of village of Cayanlipe, 14 km SW of *Villa Nueva*, 12°52′25″N, 86°54′50″W, alt. 15 m, 16 Dec. 1991 (fr), *H. H. Iltis, M. Castrillo & C. Medina 30900* (WIS); re-collection of the holotype population (see above), 18 Dec. 1991 (fr), *H. H. Iltis, M. Castrillo, C. Medina & C. Aker 30919* (HNMN, WIS), with a 2 kilo total of bulked seed germ plasm of same deposited in the germ plasm banks of the International Center for Maize and Wheat Improvement, Texcoco, Mexico, I.D. *CIMMYT 13451*, fide S. Taba (*11083*, fide Bird, 2000); the Nicaraguan Agricultural University (UNA), Managua; the U.S.D.A., Northcentral Regional Plant Introduction Station (NC7), Ames, Iowa, I.D. Ames 21893; and John Doebley, now in Madison at the University of Wisconsin's Genetics Department.

Ethnobotanical notes on "Teosinto." On 8 October 1991 at Rancho Apacunca, Felix Valenidaceda indicated that "teosinto" is consumed by cattle only when young. When mature, the plant is used to make ramadas [fences, shelters, or roofs perhaps]. Valenidaceda told us that "from 7 to 10 years ago, the area from El Jicote to El Rodeo to Los Pozitos was covered by teosinto, common enough to be dominant in the local vegetation. Cattle grazing has *always* been practiced in this region. . .", though in the more recent past it has become a year-round enterprise, probably correlated with the construction of the prominently elevated gravel road to Rancho Apacunca. Apparently ". . .10, maybe 15 years ago Apacunca was not occupied year round; it was inhabited only during the summer months because water then becomes available. . ." hence the name (on the 1961 topographic sheet made from 1954 aerial photos) Veraneadero Apacunca. (Note: the 1989 topographic map *Villa Nueva* 1:50,000 gives just plain Apancunca—the *n* evidently in error—the *omission* of Veraneadero suggesting full-year occupancy.) "The people moved seasonally from a community, called La Mesa, near Somotillo, ca. 12 km to the north, to Apacunca in April or May, when it begins to rain. They stayed until December (or longer, depending on water availability) and then returned to La Mesa until May. In the lowlands, i.e., Apacunca, they tended a few cattle and raised corn." This information comes from local *campesinos*, all men, who indicated that when "teosinto" was encountered in their plots, presumably slash and burn, the cattle consumed it as fodder. Implicit in this description (which was specified by Achiles Peralta, a citizen of the village of Israel) was the observation that when the people finally settled in Apacunca year-round and maintained large herds of cattle and planted crops other than corn, i.e., rice, the teosinte became scarce (cf. Wilkes in litt. about a similar situation in the Valley of Mexico).

KEY TO THE ANNUAL SPECIES OF *ZEA* SECTION *LUXURIANTES* DOEBLEY & ILTIS

(Organized to fit into the key in Doebley & Iltis, 1980: 991, underneath the number 2 couplet).

2a. Tassels 12–24 cm long, the branches rather stiffly ascending; number of tassel branches (4–)10–28, each 7–21 cm long; central tassel branching space (or axis) short, (1–)3–6(–9) cm long; number of spikelet pairs per primary tassel branch 20–35 or fewer; length of culm (peduncle) (10–)12–20(–23) cm long; Mexico (Oaxaca), southeast Guatemala, Honduras (Choluteca) . . . . . *Zea luxurians* (Durieu & Ascherson) Bird

2a. Tassels (23–immature) 26–32 cm long, the branches relatively lax and drooping; number of tassel branches 27–38, each 13–28 cm long or longer; central tassel branching space (8–)10–12

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Figure 3. Hunting teosinte in Nicaragua. Alfredo Grijalva, Herbarium curator at UCA, Managua, Nicaragua, and Hugh H. Iltis (in front), Director of WIS, accompanied by Bruce Benz, Assistant Professor of Biology at Texas Wesleyan University, Ft. Worth, Texas (who took the photograph), crossing a gallery forest on the broad, flat, seasonally flooded lowlands inland from the Golfo de Fonseca on the Pacific Ocean in Depto. Chinandega, in southwestern Nicaragua near the Honduran border. Photo Bruce Benz.

cm long; number of spikelet pairs per primary tassel branch mostly 36–64 or more; length of culm (only one available) 25.4 cm long ; Nicaragua (Chinandega) . . . . . *Zea nicaraguensis* Iltis & Benz

Discussion

The closest relative of *Zea nicaraguensis* is clearly *Z. luxurians* of southeastern Guatemala (Doebley & Iltis, 1980; Doebley, 1983; Iltis et al., 1986), an annual with similar, strongly two-nerved lower glumes. But, as the above key and Figure 2 show, the primary tassels of *Z. luxurians* are smaller in many ways than those of *Z. nicaraguensis*, differing in tassel length (12–24 vs. 23–32 cm), number of tassel branches (4–28 vs. 27–38), central tassel branching space (1–9 vs. 8–12 cm), and number of spikelet pairs per branch (ca. 20–35 vs. 36–64). Moreover, *the primary tassels of the type specimens are all still immature* (Fig. 1B): (1) their spikelets are all closed, and not anywhere near anthesis; (2) the lower quarter of the tassels, their branches still tightly enveloped by the uppermost leaf sheath for 6–8 cm, are still only the palest green, with the exposed ends of the branches still lax and drooping off together and sideways (Fig. 1B); and (3) even more immature are the markedly undeveloped tassel culms, that is, the ultimate, generally very long internode beneath the male inflorescences: in the seven (out of the nine) type specimens measured, they are only 2.5–5.6 cm long, soft and pale yellow, and are yet to dramatically elongate to their full length sometime just before anthesis. Fortunately, we do have, from this same population, one fully mature peduncle, collected on 18 December 1991, the day we returned to collect 2 kilograms of ripe seed germ plasm from this, now weather- and animal-devastated, population (Fig. 1A). This single "corpse" of a tassel is borne on a culm fully 25.4 cm long (!), with the tassel itself, however, reduced to its axis and a few short branch stubs. Such a long culm (or even longer as suggested by Fig. 1A) is what one would expect, in comparison to the shorter culm length range (10–23 cm) of the Guatemalan *Z. luxurians*. Thus what a fully mature Nicaraguan teosinte tassel would look like in all its glory, we can only guess. But with tassels over 40 cm in diameter, it surely must be a beautiful sight.

While our limited measurements of *Z. luxurians* spikelets agree well with those provided by Doebley (1983), this by far the most sophisticated mathematical analysis of the *Zea* male inflorescence ever, our values for *Z. nicaraguensis* clearly exceed his numbers for *Z. luxurians*. Unfortunately, because of our collection's immaturity, we did not measure many of the characters he employed, a task that must be left to others at a time when better field-collected material of this species will become available.

Molecular evidence. Recently, Buckler and Holtsford (1996) demonstrated from ribosomal ITS (internal transcribed spacer) evidence that within the *Luxurians* clade, the Nicaraguan teosintes from Chinandega (our *Z. nicaraguensis* from near Apacunca) are basal to the Chiquimula teosintes from Guatemala (*Z. luxurians*), a finding of considerable interest.

Environment versus genetics, the unknown in the equation. How much of the large size of the *Z. nicaraguensis* tassels, and of the Nicaraguan teosinte plants as a whole, is due to the moist habitat and how much to genetics, is at present unanswerable. Certainly, wild *Zea* species are enormously sensitive to even the slightest environmental changes in daylength and moisture, as Iltis (1983, 1987, 2000) has repeatedly described in regard to tillering and branching. Bird (2000) recently demonstrated this experimentally with *Z. nicaraguensis*, grown in Mexico City and North Carolina from totypic seeds (*Iltis et al. 30831*), producing bizarre plants not resembling the native grown material whatsoever. The label data of *Doebley 648*, grown in Minneapolis and cited above, make the same point.

How would natural selection act on such easily modifiable and labile phenotypes? For teosinte, the environment brings out unsuspected, genetically based potentials, with the genotype essentially remaining the same (Iltis, 1983: 892). Continued, directional selection would increase this potential to the point where it will become *genetically assimilated* (Waddington, 1957) by what Mayr (1970: 110–111) calls *threshold selection*, which allows certain cryptic genes to become expressed. Speciation, by way of a founder population in geographic isolation, such as here in Nicaragua, might thus soon occur.

While we do not know the chromosome number of *Z. nicaraguensis* (probably diploid like *Z. luxurians*, with n = 10), nor the degree of interfertility between *Z. nicaraguensis* and *Zea mays* L. subsp. *mays*, with no such hybrids known, we anticipate that this species will provide maize breeders with a potentially valuable source of germ plasm that may lead to the development of maize capable of growing in water-logged soils.

Finally, it was the desire to see fully mature flowering material of the Nicaraguan populations that caused us to delay publishing, until events beyond

our control have now forced the issue. Although collecting this population at the right time would have its problems (the area was land-mined during the recent Contra war), it would have its rewards as well. We may only hope that now, with the appearance of the *Flora de Nicaragua* (Stevens et al., 2000), the ever-larger contingent of well-trained Nicaraguan botanists and environmentalists, with aid from conservationists worldwide, will take up this challenge and work hard to have these wild populations of teosinte preserved, if at all possible, in situ (Guzman & Iltis, 1991). It should and can be done! Long live Nicaraguan biodiversity!

[Postscript: The Honduran Collection of P. C. Standley: This remarkably prolific collector of the Mesoamerican flora discovered a teosinte in 1949 at San Antonio de Padua, Department of Choluteca, Honduras, at 850 m (Standley, 1950) (*P. C. Standley & J. de Dios Cruz 24677*), a station not much more than 90 km north from those we located in Nicaragua. Standley's herbarium material (in F, UC, US), relegated to *Z. luxurians* by Wilkes (1967), Doebley and Iltis (1980), and Doebley (1983), includes old tassels that suggest affinity to the Guatemalan populations. On 17 October 1991, the first author traveled the length of the valley east of Pespire up to San Antonio de Padua, but had no success in locating any teosinte. However, at Pespire and localities to the east of it, a number of informants (six out of ten, all older men) instantly recognized fruitcases of teosinte shown to them as "ah, sí, es maíz café" or "maizena," local names of a plant which, they said, "used to grow abundantly here thirty years ago and was sometimes cultivated as a coffee substitute." Some even said it used to be planted (*sembrar*), but at San Antonio, where the road ends high up in the mountains, no one seemed to know it. Admittedly, it was nearly dark when we arrived and informants were scarce. The two other collections from San Antonio, cited by Doebley (1983: 37) as *Z. luxurians* [*Freytag s.n.* (MO) and *Molina 5881, 5882* (US)], were not now available to us, but at the time of our collaboration (Doebley & Iltis, 1980) we must have thought them well within the range of variability of *Z. luxurians.]*

Acknowledgments. Thanks are due first of all to the perceptive Adrian Ramos and Allan Hruska of CARE Nicaragua, the discoverers of teosinte in Nicaragua; to Lowell Nault, who conveyed two fruitcases to us; and to John Doebley, who grew them out and made preliminary observations: to all, our appreciation. We must next gratefully acknowledge the help of our botanical colleagues at the National Herbarium of Nicaragua, Managua (HNMN), Cristobal Medina and Milton Castrillo, but especially Alfredo Grijalva, its Director, who without protest drove us twice in one week from Managua to Chinandega and thus ensured our success in locating the new teosinte. At Rancho Apacunco we were aided by Conrado Moradez and Sr. Tinoco, the owner of the land, who gave us permission to collect and graciously allowed us to borrow his horses and his well-armed guides. Reaching back in time, we are grateful to my former student and Guatemalan botanist, Karen Lind, for the three population samples of *Z. luxurians* collected, at the first author's request, near El Progreso, Jutiapa, Guatemala, in 1978.

For help during the Honduran excursion to relocate Standley's *maiz café,* the first author much enjoyed the hospitality of the Escuela Agrícola PanAmericana at Zamorano and the aid given there by George Pilz, and especially Roberto Young and Ramon Zuniga, both of the latter invaluable and stimulating field companions. Editorial comments on the manuscript by Ted Cochrane and an anonymous reviewer were much appreciated, as was the naming of our grass collections by Gerrit Davidse. Finally, this research was supported by the Nave Bequest to the Latin American Studies Program of the University of Wisconsin-Madison and by the O. N. and E. K. Allen Fund of the U.W. Herbarium (WIS). The illustrations were expertly prepared by Kandis Elliot and the manuscript by Loraine Stribley of the U.W. Botany Department and by Liz Levitt, undergraduate student in the U.W. Zoology Department: to our thanks we add our affection.

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Two New Brazilian Species of *Oryctina* (Loranthaceae) with a Revised Key to the Genus

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ABSTRACT. Two new species from central Brazil of the South American genus *Oryctina* (Loranthaceae) are described and illustrated, *O. eubrachioides* Kuijt and *O. quadrangularis* Kuijt. The absence of a calyculus in the male flower of several *Oryctina* species represents a nearly unique feature within the family, and the lack of staminodia in the female flower has elsewhere been noted only in two species of *Cladocolea*. The affinities of Brazilian species with Venezuelan ones are briefly discussed. Distinctions between the two groups of species, based largely on the structure of bracteoles and staminodia, suggest that the generic name *Maracanthus* may have to be revived for the Venezuelan species. A new key to the genus is presented, including the new species.

In recent years, the South American genus *Oryctina* (Loranthaceae) has significantly swelled from its original monotypic status (Kuijt, 1991). The genus currently consists of six species, but recent collections have brought to light two more, distinctive Brazilian species. Both are herein described and illustrated, and followed by some general comments on the genus, including a new key to all species now comprising *Oryctina*.

Oryctina is one of 16 hemiparasitic genera of Loranthaceae, all of which are strictly limited to the New World. This group of genera may consist of two distinct lineages as indicated by flower size and other features, *Oryctina* being part of the small-flowered group also containing the better known and larger genera *Phthirusa* and *Struthanthus*. Nearly all New World Loranthaceae possess an inconspicuous calyculus directly below the 4 to 6(7) petals. The frequently minute flowers and, upon occasion, the much contracted inflorescences, have in the past posed considerable challenges to the taxonomic interpretation of some of these genera.

Oryctina eubrachioides Kuijt, sp. nov. TYPE: Brazil. Minas Gerais: Januária, Vale do Peruaçu, inicio do Cerrado de Judas, 15°7′10″S, 44°13′21″W on *Aspidosperma, Salino & Gotschalg 4037* (holotype, BHCB not seen; isotype, LEA). Figures 1, 2.

Frutex dioicius, squamatus, gracilis; internodiis ad 1.5 cm longis, teretibus. Folia ad 1.5 mm longa, cucullata peltata. Spicae paene sessiles, ca. 4 mm longae.

Squamate plants, sparsely branched, the branches very slender, stiff, internodes to 1.5 cm long, terete, covered with innumerable raised stomata forming conspicuous, minute tubercles. Leaf-scales about 1.5 mm long, strongly cucullate and peltate, fringed with dark brown hairs, the adaxial surface also with brown hairs, hairs becoming white with age, leaf-scales paired but in threes on vigorous shoots. Dioecious, the inflorescences nearly sessile, about 4 mm long at anthesis, in the male plant often some 20 pairs in series on an unbranched shoot, mostly singly in the axil of scale-leaves, sometimes with a second, smaller, superposed inflorescence; peduncle somewhat less than 1 mm, followed by up to 10 pairs of brown-fringed, minute scale-leaves, each subtending a bright lemon-colored bud or flower, the mature bud ca. 1 mm diam., globular, flanked by 2 laterally placed, very inconspicuous, blunt, hair-fringed prophyllar bracteoles. Petals 6, strongly dimorphic in both sexes, the longer ones 1 mm long, shorter ones ca. 0.5 mm. Male flower lacking a calyculus, anthers ca. 0.25 mm, globular but slightly bilobed, bilocular, sessile on the middle of the petals; style 0.5 mm long, cylindrical, stigma not differentiated. Female flower 1.5 mm long when mature, half of which is ovary, calyculus distinct, petals without staminodial remnants, style to 0.5 mm long, cylindrical, stigma slightly differentiated as a terminal swelling, very slightly papillate. Fruit at least 3 × 1.5 mm, ellipsoid but with a somewhat expanded calycular region, blunt-tipped.

The specific name indicates a striking general similarity to the genus *Eubrachion* (Eremolepidaceae), a similarity that is carried through to the more or less peltate scale-leaves (see the illustration in Kuijt, 1988, fig. 2d & e). In the present species, however, the scale-leaves are profusely fimbriate, which is not true for *Eubrachion*. The partial base of the plant included in the LEA specimen cited below suggests that no epicortical roots are present in *O. eubrachioides*. The occurrence of such roots and/or their placement on the plant in

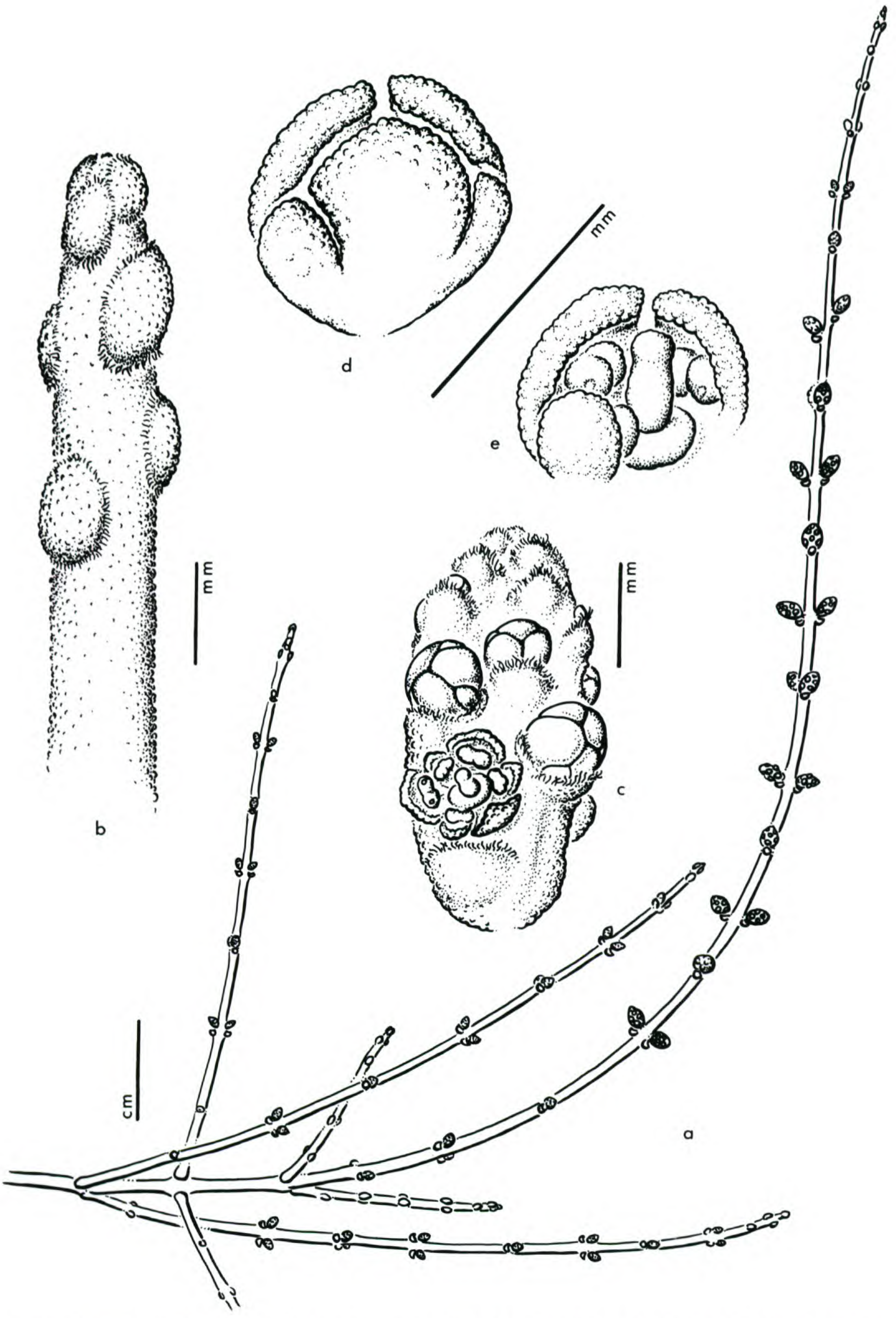

Figure 1. *Oryctina eubrachioides* Kuijt, *Salino & Gotschalg 4037* (LEA). —a. Habit, with mature fertile branch ascending at right. —b. Young shoot tip, showing fringed scale-leaves. —c. Inflorescence. —d. Male bud, showing five of the six petals; note absence of calyculus. —e. Male flower, partly dissected to show three petals, their anthers, and the rudimentary style.

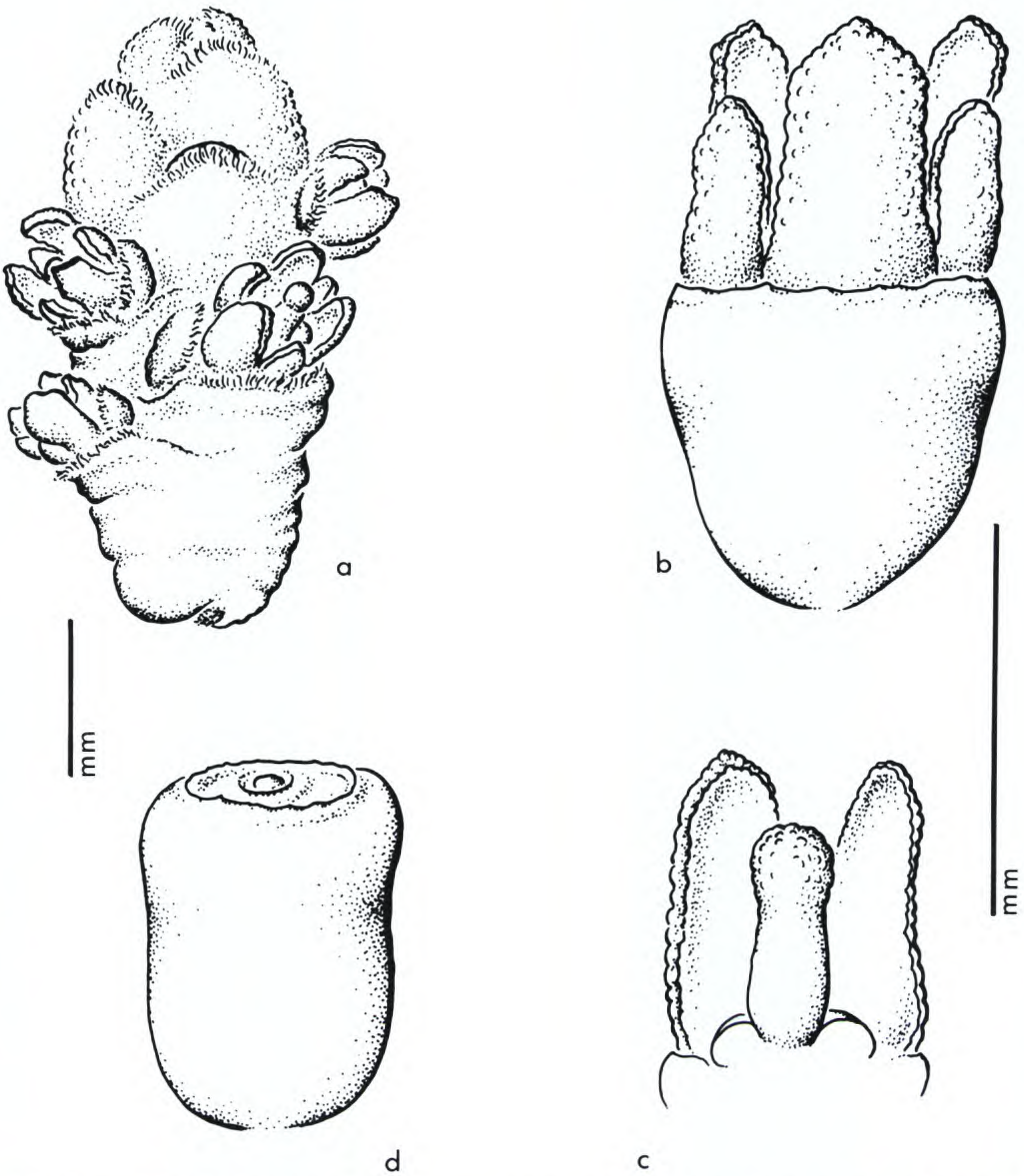

Figure 2. *Oryctina eubrachioides, Salino & Stehmann 3304* (LEA). —a. Female inflorescence. —b. Female bud, showing five of the six petals. —c. Female flower, partly dissected. —d. Fruit.

other small-flowered neotropical Loranthaceae frequently provide important taxonomic distinctions.

The diagnostic features of *O. eubrachioides* consist of the combination of an extremely attenuate habit, the peculiar, fringed peltate scale-leaves, and the absence of a calyculus in the male flower.

Paratype. BRAZIL. **Minas Gerais:** Januária, Vale do Rio Peruaçu, Cerrado do Judas, *Salino & Stehmann 3304* (BHCB, LEA).

Oryctina quadrangularis Kuijt, sp. nov. TYPE: Brazil. Minas Gerais: Januária, Vale do Peruaçu, carrascal próximo da entrada para Fazenda Terra Brava, 15°6′45″S, 44°15′36″W, *Salino & Gotschalg 4009* (holotype, BHCB not seen; isotype, LEA). Figure 3.

Plantae foliosae, dioiciae; caulibus quadrangularibus; internodiis ad 2 cm longis. Folia ad 20 × 8 mm, elliptica. Pedunculi ca. 7 mm longi, quadrangulares.

Small, branched plants with rather stout, strongly and persistently quadrangular internodes to 2 cm long, the stem ridges callused even when young and becoming light-colored, the stomata crowded and

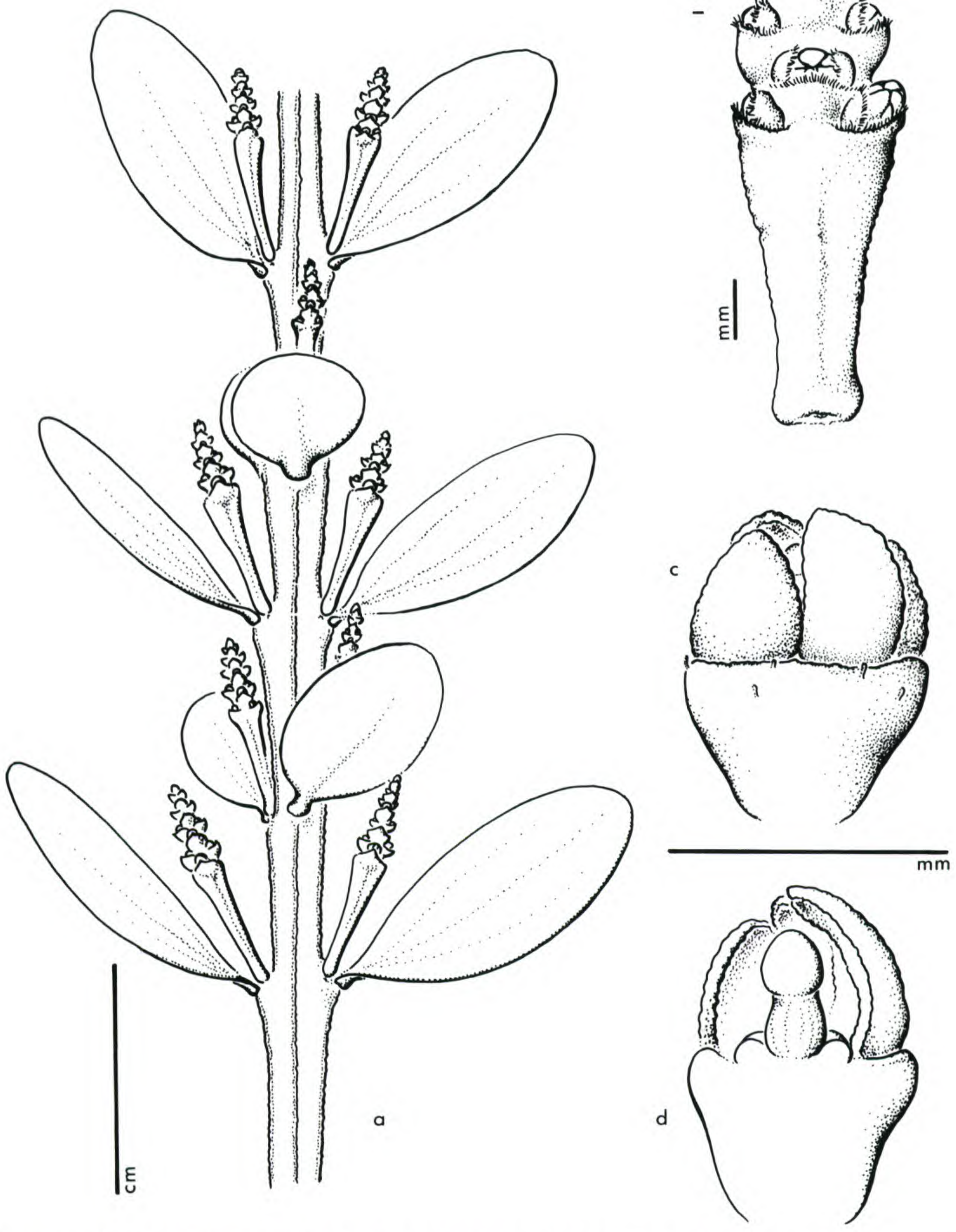

Figure 3. *Oryctina quadrangularis* Kuijt, *Salino & Gotschalg 4009* (LEA). —a. Habit. —b. Female inflorescence. —c. Female bud. —d. Female flower, partly dissected, showing three of the six petals and the style.

raised as minute tubercles. Leaves to 20 × 8 mm, elliptical, apex and base obtuse, petiole 1 mm, venation with 3 or 5 palmate, rather obscure veins; leaf surface similar to stem surface; axillary region of stem and petiole with brown hairs. Inflorescence at least 12 mm long (immature), peduncle ca. 7 mm long, strongly quadrangular or compressed, expanding distally, the fertile portion bearing at least 10 pairs of scale-leaves fringed with brown hairs, each scale-leaf subtending a single, sessile flower flanked by two lateral, broad and obtuse prophyllar bracteoles. Dioecious, the type female. Mature bud 1 mm long and nearly as broad, ± ovoid; ovary half the size of the bud; petals dimorphic, the larger ones 0.5 mm long, the others somewhat shorter; staminodial remnants absent. Style as long as shorter petals, cylindrical, the upper half a distinct, ovoid stigma. Fruit unknown.

The only collection (other than the type) of *O. scabrida* (Eichler) Tieghem ever recorded, to my knowledge, was made in 1973 (*Anderson 6881*, Brazil. Goiás: 25 km SW of Monte Alegre de Goiás, LEA, NY, RB). However, I now consider this an erroneous assignment, and include this collection under the present species on a provisional basis. The internodes of *O. scabrida* are "only very slightly quadrangular" and soon become terete (Kuijt, 1976b), while those of *O. quadrangularis* are strongly and persistently so. Additionally, the inflorescence peduncle of the only reliably known collection of *O. scabrida* is clearly terete and slender, and relatively young, and its leaves are much more slender than those of *O. quadrangularis*. However, the near absence of the striking, marginal hairs on all young scale-leaves of the Anderson collection contrasts with the latter, cautioning me to cite that collection here in a provisional way only.

Discussion

The genus *Oryctina* is closely related to *Cladocolea* (Kuijt, 1975, 1992), differing in the mostly determinate inflorescences and ebracteolate flowers of the latter. The genus *Oryctanthus*, also closely related to the present genus, consistently differs from all other small-flowered genera of Loranthaceae in having a unique pollen structure (Feuer & Kuijt, 1985), stellate fiber bundles in the leaf (Kuijt, 1976b), and strap-shaped floral bracteoles.

In the female flowers of Loranthaceae thus far described, with the exceptions of *Tupeia antarctica* (J. G. A. Forster) Chamisso & Schlechtendal (Kuijt, 1969, fig. 2–10h), *Cladocolea coriacea* Kuijt (Kuijt, 1987), as well as *Oryctina scabrida* and *O. subaphylla* C. T. Rizzini (Kuijt, 1981), staminodial remnants are always present. The new species present us with further examples of lacking staminodial remnants. We may anticipate, again in parallel with Viscaceae (see Kuijt, *Phoradendron*, in prep.), and also like *O. eubrachioides* and *O. subaphylla*, that an aborted style will be present in the male flower of *O. quadrangularis*.

The calyculus in Loranthaceae has been much debated, and is generally regarded as a greatly reduced calyx. It normally exists as an inconspicuous rim of tissue directly below the perianth, and is diagnostic of the family. In a single species of Loranthaceae, *Tupeia antarctica* from New Zealand, the male flower lacks a calyculus, while this structure is present in the female (see Kuijt, 1969). Rizzini (1977) observed the absence of a calyculus in *O. subaphylla*, but implied that this applied also to female flowers. It is of great interest, therefore, to discover another species, *O. eubrachioides*, also lacking a calyculus in the male flower while possessing it in the female flower. The generally reduced condition of this species strongly suggests that we can regard this as a reductional phenomenon. It might be added that the male flowers of the genus, especially those of *O. eubrachioides* and *O. scabrida*, are probably the smallest flowers in Loranthaceae, even in the small-flowered neotropical group. Unfortunately, no male flowers of *O. quadrangularis* are available but they, also, likely lack a calyculus.

Even though the four known Brazilian species, all clearly closely related, are inconspicuous plants and easily overlooked in the field, their rarity invites comment. The generic type *O. scabrida* was collected in 1840 and may still constitute the only authentic preserved material. One of the species here newly described (*O. quadrangularis*) is known only from the type collection; the other, *O. eubrachioides*, is known from just two collections, both from the Januária region in Minas Gerais. The second species to be described in the genus, *O. subaphylla* in 1977, is with certainty also known from only two specimens, the type and *Pirani 1837* (LEA). A third specimen, *Pirani et al. 1951* from Dianopólis, 10 km from Taipas near Morro da Cabeça Branca (Serra do Ouro), Goiás (LEA, SPF), is here also provisionally assigned to *O. subaphylla*. It thus seems clear that the four Brazilian species are rare and highly localized species, and concentrated in a very small area of central Brazil.

The information presented in the present paper increases the systematic cohesion of the Brazilian species cluster but simultaneously distances them from the other four *Oryctina* species (*O. badilloi* (Ferrari) Kuijt, *O. myrsinites* (Eichler) Kuijt, *O.*

chlamydata (Rizzini) Kuijt, and *O. pedunculata* (Kuijt) Kuijt). These four species occur in Venezuela and the Guianas, at least 1800 km to the northwest of Brazilian taxa. In the first two species, *O. badilloi* and *O. myrsinites*, flowers are bisexual. However, *O. chlamydata* and *O. pedunculata* are dioecious plants (Kuijt, 1976a). Even in these dioecious species, the staminodia in female flowers are unusually large and very different from Brazilian *Oryctina* species. Furthermore, all flowers of the four species from northwestern South America have distinctive calyculi. Finally, the shape of their bracteoles, consistent at the generic level in neotropical Loranthaceae (for example, *Oryctanthus*, Kuijt, 1976b), is quite different from those in Brazilian species. In the four species found outside Brazil, bracteoles are conspicuous, relatively large, triangular or naviculate structures. These bracteoles are included in the floral cavity, and not very different from small scale-leaves elsewhere on the plant. In the Brazilian species, bracteoles are very low crests placed on the rims of the floral cavities and extremely inconspicuous. It is possible that, as more information becomes available, the generic name *Maracanthus* Kuijt will need to be revived for the four western species, even if only at the subgeneric level. Consequently, it is conceivable that a stricter diagnosis of the genus *Oryctina* will focus on the absence of the calyculus in the male flower, the lack of staminodial remnants in the female flower, the shape of the floral bracteoles and anthers, as well as its geographic distribution.

Oryctina subaphylla Rizzini, Plant Syst. Evol. 128: 51–52. 1977. TYPE: Brazil. Bahia: near Espigão Mestre (or Serra Geral), Mar. 14 1972, *W. R. Anderson et al. 36949* (holotype, RB; isotype, NY)

Oryctina piranii Rizzini, Rev. Brasil. Biol. 51: 460–461. 1991. Syn. nov. TYPE: Brazil. Goiás: Chapada dos Veadeiros, Rodovia 118, near Rio das Almas, between Teresina ad Alto Paraíso, *Pirani et al. 1837* (holotype, RB; isotypes, K, LEA, NY, SPF).

KEY TO THE SPECIES OF *ORYCTINA*

1a. Leaves longer than 3 cm or, at least, more than ½ as wide as long; flowers bisexual or unisexual and then the female flowers with conspicuous staminodia; floral bracteoles naviculate, placed inside floral cavities; French Guiana to western Venezuela.
  2a. Anthers lacking papillate connective horn, but with 2 pollen sacs; spike sessile, 3 mm long or less, bracts and bracteoles deciduous; leaves with conspicuously furfuraceous lower midribs . . . . . *O. myrsinites*
  2b. Anthers and staminodia with prominent, papillate connective horn, the anthers with 4 pollen sacs; spike peduncles at least 2 mm long, bracts and bracteoles persistent; leaves lacking furfuraceous lower midribs.
    3a. Plants sympodial; twigs and leaf margins smooth but twigs with small lenticels, terete; bracts with hyaline margins . . . . . *O. chlamydata*
    3b. Plants percurrent; twigs and leaf margins furfuraceous, but twigs quadrangular; bracts lacking hyaline margins.
      4a. Flowers bisexual, usually fewer than 10 per spike; peduncle < 0.5 cm long; spike emerging from a strongly developed corky crater . . . . . *O. badilloi*
      4b. Flowers unisexual, to 50 per spike; peduncle at least 1 cm long; spike lacking basal crater . . *O. pedunculata*
1b. Leaves less than 3 cm long, and less than (½) ⅓ as wide as long; flowers unisexual (or assumed so), the female ones lacking staminodial remnants; floral bracteoles low crests on rim of floral cavities; Goiás, Bahia, and Minas Gerais.
  5a. Leaves scale-like or shield-like, with peltate attachment, and entirely fringed with brown hairs . . . . . *O. eubrachioides*
  5b. Leaves not as above.
    6a. Inflorescence sessile or nearly so, the peduncle no more than 1 mm long . . . . . *O. subaphylla*
    6b. Inflorescence pedunculate, the peduncle 7 mm or more (about ½ as long as the entire inflorescence).
      7a. Internodes and peduncles quadrangular . . . . . *O. quadrangularis*
      7b. Internodes and peduncles terete . . . . . *O. scabrida*

Acknowledgments. The financial support from the Missouri Botanical Garden and the Natural Sciences and Engineering Research Council of Canada is gratefully acknowledged.

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A New Species of *Thladiantha* (Cucurbitaceae) from Yunnan, China

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ABSTRACT. A new species, *Thladiantha palmatipartita* A. M. Lu & C. Jeffrey, is described from Yunnan, China. It differs from other species of the genus *Thladiantha* in its palmately 5-lobed leaves.

Thladiantha palmatipartita A. M. Lu & C. Jeffrey, sp. nov. TYPE: China. Yunnan: Fengkou (Fengke), 27°40′N, 8000 ft., June 1914, *George Forrest 12726* (holotype, E). Figure 1.

Species foliis palmatim 5-partitis a congeneris diversa. Herbae scandentes. Caulis sulcato-angulatus, leviter puberulus vel glabrescens, 1–3 m longus. Cirrhi simplices, pubescentes. Petiolus 3–7 cm longus; lamina ambitu late ovata vel orbiculata, 8–17 cm longa, 9–16 cm lata, chartacea, supra dense punctata, subtus dense pubescens, palmatim 5-partita, lobis oblongis, margine irregulariter dentatis, apice acutis vel acuminatis. Flores dioici. Flores masculi paniculati; pedunculus 2.5–3 cm longus, robustus, pubescens; pedicelli filiformes, 5–12 mm longi; tubus calycis cupularis, pubescens; segmenta 5, late lanceolata, 1.2–1.5 cm longa, ca. 5 mm lata, apice acuminata, trinervata; corolla campanulata, segmentis 5, oblongis vel lanceolato-oblongis, 1.5–1.8 cm longis, ca. 6 mm latis, apice acuminatis, trinervatis; stamina 5, filamentis 2 mm longis, antheris ca. 3 mm longis, unilocularibus. Flores feminei solitarii vel binales; ovarium anguste oblongum, villosum, 1.5–2 cm longum; stylus columnaris, apice trifidus, stigmatibus dilatatis, bifidis. Fructus oblongus, baccatus, indehiscens, apice rotundus, basi angustissime attenuatus, laevis, 7.5 cm longus, ca. 3.5 cm crassus. Semina numerosa, horizontalia, laevia, ca. 6 mm longa, 3 mm lata.

Scandent dioecious herbs. Stems sulcate-angular, 1–3 m long, puberulous or glabrescent. Tendrils simple, pubescent. Petioles 3–7 cm long, puberulous; leaf blade broadly ovate or orbicular in outline, 8–17 × 9–16 cm, chartaceous, adaxially densely punctate, abaxially densely pubescent, palmately deeply 5-lobed, lobes oblong, margin irregularly dentate, apex acute or acuminate. Flowers unisexual. Male flowers: panicle short, many-flowered; peduncle 2.5–3 cm long, robust, puberulous; pedicels slender, filiform, 5–12 mm long; calyx tube cupular, pubescent; segments 5, broadly lanceolate, 1.2–1.5 × 0.5 cm, apex acuminate, 3-nerved; corolla campanulate; segments 5, narrowly oblong or lanceolate-oblong, 1.5–1.8 × 0.6 cm, apex acuminate, 3-nerved; stamens 5; filaments 2 mm long; anthers ca. 3 mm long, 1-locular. Female flower solitary or paired, calyx and corolla as in the male; ovary narrowly oblong, villous, 1.5–2 cm long; style columnar, apically trifid; stigmas dilatate, 2-lobed. Fruit oblong, smooth, baccate, indehiscent, apex rounded, base attenuate, 7.5 cm long, ca. 3.5 cm diam. Seeds numerous, horizontal, smooth, ca. 6 mm long, 3 mm broad. Flowering in June and fruiting in September.

The new species differs from the other known species of *Thladiantha* (Li, 1997; Lu & Zhang, 1981) in its palmately deeply 5-lobed leaves. It is related to *T. hookeri* C. B. Clarke but differs by its calyx tube cupular, segments broadly lanceolate, 1.2–1.5 × 0.5 cm (rather than calyx tube broadly campanulate, segments narrowly triangular, ca. 4 × 1.5 mm).

Paratypes. CHINA. **Yunnan:** Yungning (Yongning), 27°40′N, 8–9000 ft., female plant, June 1914, *George Forrest 12440* (E); Yung-pe (Yongsheng), 26°45′N, 9000 ft., in fruit, Sep. 1913, *George Forrest 11166* (E).

Acknowledgment. The authors thank the curator of the herbarium of the Royal Botanic Garden, Edinburgh (E) for the loan of specimens.

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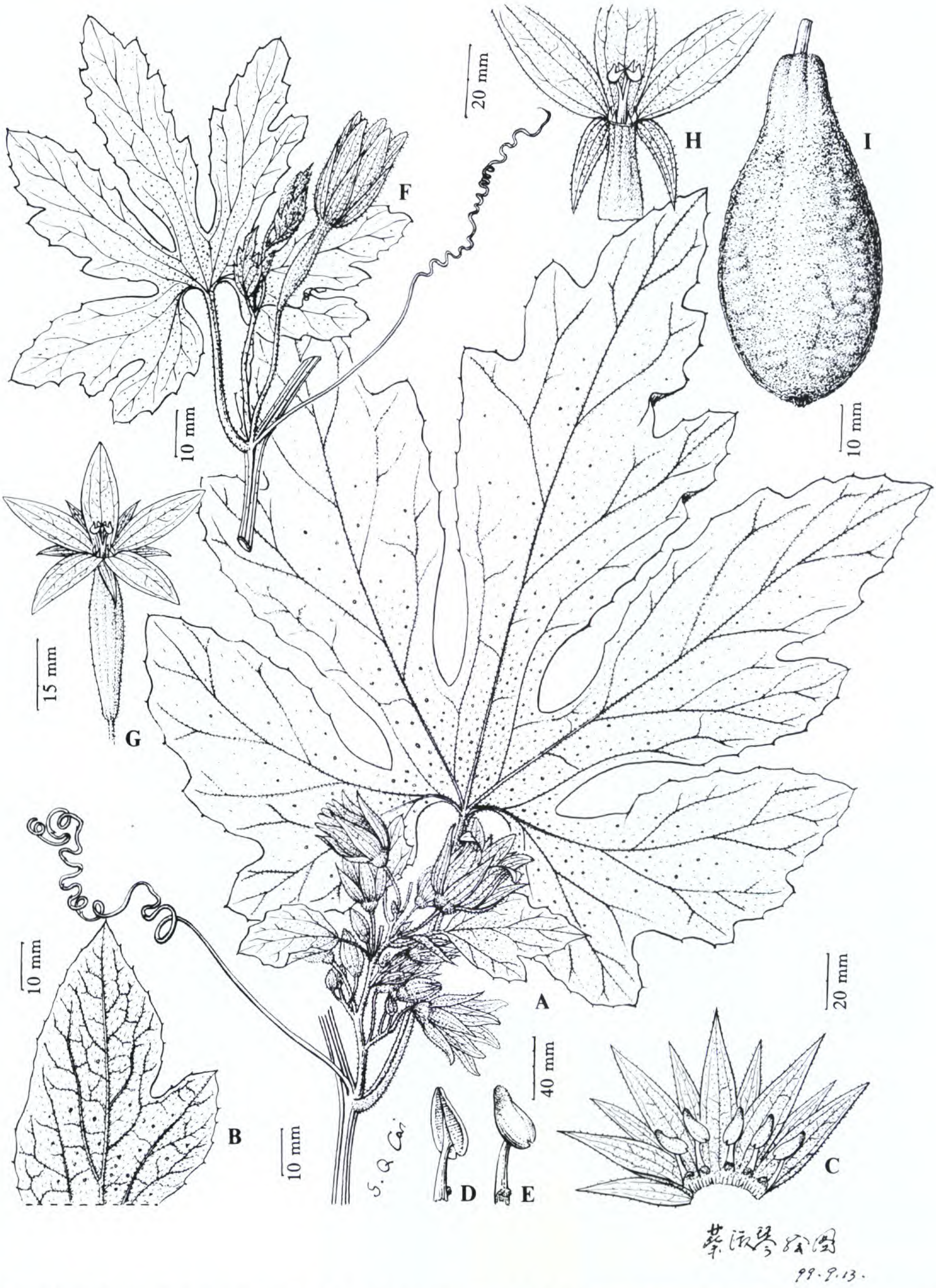

Figure 1. *Thladiantha palmatipartita* A. M. Lu & C. Jeffrey. —A. Habit, male plant. —B. Part of abaxial surface of leaf blade. —C. Male flower, expanded. —D. Abaxial view of stamen. —E. Adaxial view of stamen. —F. Habit, female plant. —G. Female flower. —H. Female flower, expanded. —I. Fruit. A–E from the holotype, *G. Forrest 12726* (E), F–H from *G. Forrest 12440* (E), I from *G. Forrest 11166* (E).

New Combinations in *Phedimus* (Crassulaceae)

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ABSTRACT. During the preparation of the account of the Crassulaceae for the *Flora of China*, Volume 8, it was decided that *Phedimus* Rafinesque should be separated from *Sedum* L. It is therefore necessary to publish new combinations in *Phedimus* for three varieties and one species previously recognized in *Sedum*: *P. aizoon* (L.) 't Hart var. *latifolius* (Maximowicz) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov., *P. aizoon* var. *scabrus* (Maximowicz) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov., *P. aizoon* var. *yamatutae* (Kitagawa) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov., and *P. hsinganicus* (Y. C. Chu ex T. N. Liou) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov. One subgeneric name, *Phedimus* subg. *Aizoon* (L. K. A. Koch ex Schönland) H. Ohba & Turland, is validated; it was first proposed by 't Hart but with an erroneous (and uncorrectable) basionym citation. The name *Sedum aizoon* L. var. *scabrum* Maximowicz is lectotypified.

The most widely accepted infrageneric classification of *Sedum* L. was first outlined by Ohba (1978). Until then, most species of the Sedoideae were classified in *Sedum*. Ohba (1978) classified *S. aizoon* L. and allied species in *S.* subg. *Aizoon* (L. K. A. Koch ex Schönland) H. Ohba. In the most recent commentaries on the Asian Sedoideae, Ohba (1995) separated *S.* subg. *Aizoon* from *S.* subg. *Spathulata* (Borissova) H. Ohba, treating the former as a distinct genus under the name *Aizopsis* Grulich, while 't Hart (1995) included *S.* subg. *Aizoon* and *S.* subg. *Spathulata* in *Phedimus* Rafinesque. Ham (1995) as well as Ham and 't Hart (1998) demonstrated that *S.* subg. *Aizoon* and *S.* subg. *Spathulata* are paraphyletic with respect to *S.* subg. *Sedum*. Though the species of *S.* subg. *Spathulata* differ from those of *S.* subg. *Aizoon* by their creeping sterile stems, purple or white petals, and nearly smooth testae (Ohba, 1978), these differences are insufficient to justify separation at generic rank, and so 't Hart's treatment is followed here. Except for Gontcharova (1999), *Aizopsis* has never been used in Asian regional floras. Ohba has adopted *Phedimus* in the new English-language *Flora of Japan* (Ohba, in press) and will do likewise in the forthcoming account of the Crassulaceae for the *Flora of China*, Volume 8 (Fu & Ohba, in press). Most combinations in *Phedimus* were published by 't Hart (1995), but the following additional new combinations are needed for the *Flora of China*.

Sedum, *Phedimus*, *P.* subg. *Phedimus*, and *P.* subg. *Aizoon* are distinguished as follows:

1a. Leaves terete or semiterete, margin always entire; testa reticulate or papillate-reticulate . . *Sedum*

1b. Leaves flattened, margin serrate or crenate; testa longitudinally costate or subsmooth . . . . *Phedimus*

2a. Petals purple or white; creeping sterile stem present; testa subsmooth . . . . . *Phedimus* subg. *Phedimus*

2b. Petals yellow; creeping sterile stem absent; testa longitudinally costate . . . . . *Phedimus* subg. *Aizoon*

Phedimus Rafinesque, Amer. Monthly Mag. & Crit. Rev. 1: 438. 1817.

Phedimus subg. **Phedimus.** *Asterosedum* Grulich, Preslia 56: 38. 1984. TYPE (designated by 't Hart, 1991: 52): *Phedimus stellatus* (L.) Rafinesque (*Sedum stellatum* L.; *Asterosedum stellatum* (L.) Grulich).

Spathulata (Borissova) Á. Löve & D. Löve, Taxon 34: 163. 1985. *Sedum* sect. *Sedum* subsect. *Spathulata* Borissova, Novosti Sist. Vyssh. Rast. 6: 117. 1970. *Sedum* subg. *Spathulata* (Borissova) H. Ohba, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 12: 178. 1978. *Phedimus* sect. *Spathulata* (Borissova) H. Ohba, in 't Hart & Eggli, Evol. & Syst. Crassulac. 156. 1995. TYPE: *Spathulata spuria* (Marschall von Bieberstein) Á. Löve & D. Löve (*Sedum spurium* Marschall von Bieberstein; *Phedimus spurius* (Marschall von Bieberstein) 't Hart).

When 't Hart (1991: 52) lectotypified *Phedimus*, that genus became homotypic with the later name *Asterosedum*, which was typified by *A. stellatum* in its protologue. Therefore, *Asterosedum* is now nomenclaturally superfluous, but it remains legitimate because the two names were not homotypic when *Asterosedum* was first published (*St. Louis Code*, Art. 52 Note 2, Greuter et al., 2000).

Phedimus subg. **Aizoon** (L. K. A. Koch ex Schönland) H. Ohba & Turland, comb. nov. Basionym: *Sedum* sect. *Aizoon* L. K. A. Koch ex Schönland, in Engler & Prantl, Nat. Pflanzenfam. 3(2a): 30. 1890. *Sedum* subg. *Aizoon* (L. K. A. Koch ex Schönland) H. Ohba, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 12: 179. 1978. *Aizopsis* Grulich, Preslia 56: 35. 1984. TYPE: *Phedimus aizoon* (L.) 't Hart (*Sedum aizoon* L.; *Aizopsis aizoon* (L.) Grulich).

The combination *Phedimus* subg. *Aizoon* was first proposed by 't Hart (1995: 168). However, the basionym 't Hart cited ("*Sedum* sect. *Aizoon* [W. D. J.] Koch, Syn. Fl. Germ. [Helv.], 259. 1835") does not exist. No *S.* sect. *Aizoon* was published by Koch in his account of *Sedum* in *Synopsis florae germanicae et helveticae* (Koch, 1835: 257–261). Therefore, 't Hart's combination is invalid under Article 33.3 of the *St. Louis Code* (Greuter et al., 2000). Unfortunately, this incorrect basionym citation cannot be treated as an error to be corrected under Article 33.4 (since it is an omission) or Article 33.6, thus necessitating the current nomenclatural action.

Phedimus aizoon (L.) 't Hart, in 't Hart & Eggli, Evol. & Syst. Crassulac. 168. 1995. Basionym: *Sedum aizoon* L., Sp. Pl. 1: 430. 1753. *Aizopsis aizoon* (L.) Grulich, Preslia 56: 37. 1984. TYPE: not designated; original material: Herb. Linn. 595.1 (LINN); [icon] "Anacampseros flore flavo" Amman, Stirp. Rar. Ruth. 96, t. 11. 1739.

Phedimus aizoon var. **latifolius** (Maximowicz) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov. Basionym: *Sedum aizoon* L. var. *latifolium* Maximowicz, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 9 [Prim. Fl. Amur.]: 115. 1859. TYPE: Russia. Amur River region: "in der Nähe der Bureja-Mündung," 23 Aug 1856, *Maximowicz s.n.* (holotype, LE).

Sedum austromanshuricum Nakai & Kitagawa, Rep. Exped. Manchoukuo Sect. 4, 1: 26. 1934 [as "*austromanshuricum*"]. *Sedum aizoon* L. var. *austromanshuricum* (Nakai & Kitagawa) Kitagawa, Lin. Fl. Manshur. 247. 1939 [as "*austro-manshuricum*"]. TYPE: China. Hebei: "in monte Wu-ling-shan [Wuling Shan]," 2 Sep 1933, *T. Nakai, M. Honda & M. Kitagawa 1925* (holotype, TI).

Phedimus aizoon var. **scabrus** (Maximowicz) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov. Basionym: *Sedum aizoon* L. var. *scabrum* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 29: 144. 1883. TYPE: Mongolia/China. "Mongolia australis: Siwan-tze" [? = Xiwanzi, now Chongli, NW of Beijing in Hebei Province], 1877, *Artselaer s.n.* (lectotype here designated, LE).

Ten syntypes were cited by Maximowicz in the protologue: the first three from "Mongolia australis" and the others from China, although all were probably collected in what is now Chinese territory. The first cited syntype, at LE, collected from "Siwan-tze," agrees with the taxon as currently understood with its narrowly lanceolate or elliptic-lanceolate leaves and is here designated as the lectotype. The second cited syntype, also at LE, collected from "Alaschan" by Przewalski in July 1873, better resembles *Phedimus hybridus* (L.) 't Hart in its broadly oblanceolate to narrowly obovate leaves. The authors have not traced the other syntypes.

Phedimus aizoon var. **yamatutae** (Kitagawa) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov. Basionym: *Sedum aizoon* L. var. *yamatutae* Kitagawa, Lin. Fl. Manshur. 247. 1939 [as "*Yamatutai*"]. TYPE: China. Liaoning: "Prov. Feng-t'ien: In montibus Chien-shan [Qian Shan]," s.d., *K. Yamatuta s.n.* (holotype, TI).

Sedum aizoon L. f. *angustifolium* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 9. 1883 [as "*angustifolia*"]. TYPE: China. Hebei: "environs de Pékin [Beijing]," s.d., *David 566* (holotype, P).

Phedimus hsinganicus (Y. C. Chu ex S. H. Fu & Y. H. Huang) H. Ohba, K. T. Fu & B. M. Bartholomew, comb. nov. Basionym: *Sedum hsinganicum* Y. C. Chu ex S. H. Fu & Y. H. Huang, in T. N. Liou, Fl. Pl. Herb. Chin. Bor.-Orient. 4: 230, t. 108. 1980. TYPE: China. Nei Mongol: Hulun Buir Meng, Ergun Youqi, 750 m, 8 Aug. 1951, *Z. Wang 1834* (holotype, IFP not seen).

Acknowledgments. We thank Anthony R. Brach (MO c/o Harvard University Herbaria) for providing copies of literature, and Michael G. Gilbert (MO c/o BM) for help in preparing the manuscript.

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Stenosepala hirsuta, a New Genus and Species of Gardenieae (Rubiaceae) from Colombia and Panama

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ABSTRACT. A new genus and species, *Stenosepala hirsuta*, of the *Alibertia* group (Gardenieae, Rubiaceae), from northern Colombia and southern Panama, is described and illustrated. The new taxon is distinguished from closely related genera by its needle-like calyx lobes, persistent triangular and aristate stipules, large thyrses in male individuals, and its very hirsute ovary in female flowers.

In a recent phylogenetic study of the pantropical tribe Gardenieae, I included a previously undescribed taxon from northern Colombia and southern Panama (Persson, 2000 a). Just like the genera in Gardenieae, the new taxon is characterized by having indehiscent fruits with numerous seeds in a placental pulp, and corollas with contorted aestivation. This phylogenetic study using chloroplast DNA sequences from the *rps*16 intron and *trn*L-F intergenic spacer clearly indicated that *Stenosepala hirsuta* (under the name species nova) is a member of the neotropical *Alibertia* group. However, due to poor resolution inside the *Alibertia* group, the analyses did not reveal the sister group to *Stenosepala*.

Stenosepala shares several characters with the members of the *Alibertia* group that support its inclusion in this group, such as dioecy and heteromerous flowers (male and female flowers of different merosity), as well as pollen grains shed in monads. In addition, like the majority of the species in this group, the female inflorescence consists of a solitary flower, whereas the male inflorescence is multiflowered. In subsequent analyses of the *Alibertia* group using faster evolving ITS and 5S sequences of the nuclear ribosomal DNA, the general resolution and support for several clades improved (Persson, 2000 b). However, *Stenosepala* appeared either as the sister group to the rest of the genera of the *Alibertia* group or on a basal polytomy together with *Stachyarrhena*, a clade of two *Genipa* species, and a large clade comprising *Alibertia*, *Borojoa*, *Duroia*, and *Amaioua* species. Hence, the closest relative of *Stenosepala hirsuta* remains unresolved.

Stenosepala is easily distinguished from other genera in the *Alibertia* group by its combination of narrow calyx lobes, persistent aristate stipules, a large thyrse in male individuals, and a very hirsute ovary in female flowers. The narrow calyx lobes and the hirsute young branchlets and ovary give *Stenosepala* a superficial resemblance to *Duroia hirsuta* (Poeppig & Endlicher) K. Schumann. However, *D. hirsuta* differs in many characters of which calyptrate, circumscissile stipules, which are shed as the shoot elongates, and the swollen, hollow branchlets, which house ants, are the most striking ones. Aristate stipules, narrow calyx lobes, and a large thyrse in male individiuals, as well as dioecy, also occur in *Randia* (Burger & Taylor, 1993), a non-*Alibertia* group member of Gardenieae. However, *Randia* is readily distinguished from *Stenosepala*, and the rest of the genera in the *Alibertia* group, by pollen grains shed in tetrads, a unilocular ovary with parietal placentas, the presence of thorns, and homomerous flowers.

Stenosepala hirsuta C. Persson, gen. et sp. nov. TYPE: Colombia. Antioquia: Mpio. Tarazá, corregimiento "El Doce," Hacienda "Las Mercedes," 7°28′N, 75°18′W, 150 m, 12 Sep. 1998, *F. Alzate, R. Callejas & J. Benavides 560* (holotype, HUA; isotypes, COL, GB, NY). Figure 1.

Frutex, arbuscula vel arbor, dioica, ad 10 m alta, ramis juvenibus sparse hirtellis vel hirsutis. Stipulae triangulares, aristatae, persistentes. Petiolus glaber vel hirsutus, ad 18 mm longus. Lamina in sicco papyracea, elliptica vel anguste obovata, basi anguste cuneato, apice acuminato, 19.5–29 × 8.5–11 cm. Flores masculini in thyrso, pedunculo hirsuto ad 10 mm longo. Pedicelli hirsuti 3–20 mm longi, bracteolis acicularibus. Calyx cupulatus 2.2 × 1.5 mm, lobis acicularibus. Corolla hypocrateriformis membranacea, alba, tubo ad 23 mm longo, extus sparse hirsuto, lobis sex glabris linearibus ad 21 × 2 mm. Flos femineus solitarius, pedunculo ad 2 mm longo. Calyx cupularis, dense hirsutus, lobis 8–9 acicularibus hirsutis 8–12 mm longis. Corolla hypocrateriformis membranacea eburnea, tubo ad 17 mm longo, extus hirsuto, intus glabro, lobis 21 × 3–4 mm, glabris. Ovarium 3–4-loculare, ovulis in quoque loculo 15–25. Fructus ± sphaericus 2.5–4.5 × 2.5–5 cm, aliquanto porcatus in sicco, indehiscens. Calycis lobi in fructu persistentes, sed saepe effracti. Hoc genus novus a generibus affinibus neotropicis, stipulis triangularibus aristatis persistentibus, calycis lobis acicularibus atque floribus masculinis in thyrso grandi, bene differt.

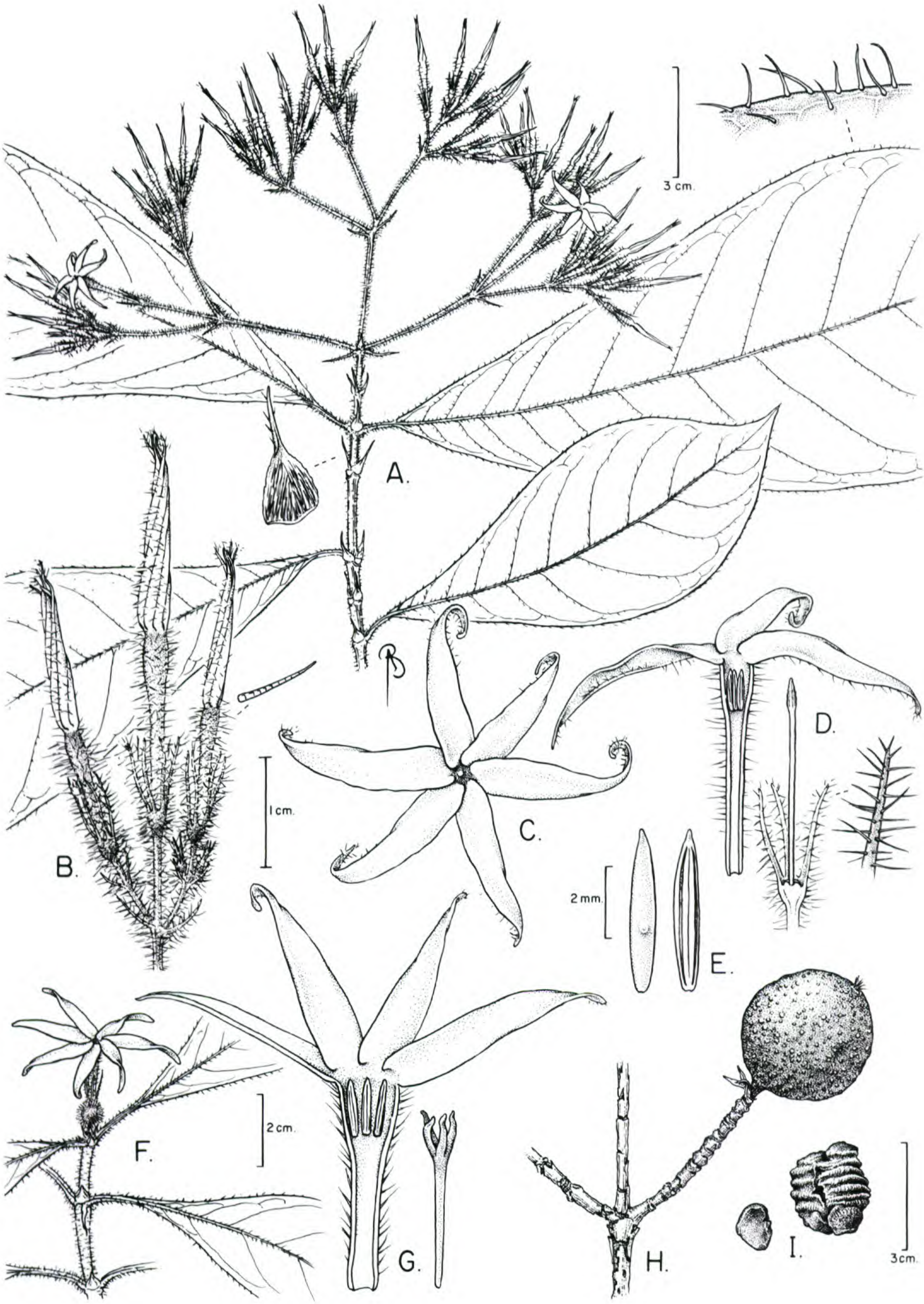

Figure 1. *Stenosepala hirsuta* C. Persson. —A. Male inflorescence with magnified abaxial view of stipule and magnified hairs at blade margin (upper right corner). —B. Detail of male inflorescence branch and magnified hair. —C. Corolla of male flower. —D. Longitudinal section of corolla and calyx of male flower, plus magnified dorsal view of calyx lobes. —E. Dorsal (left) and ventral (right) views of anthers. —F. Female inflorescence. —G. Longitudinal section of corolla

Dioecious shrubs, treelets or trees 2–6(–10) m; stem ca. 6 cm diam., twigs 2.5–4 mm diam. below fruit or inflorescence, terete, when young sparsely hirtellous or hirsute, bark on older twigs peeling. Long and short shoots intermixed on main axes and on lateral branches, short shoots often ending in inflorescences. Stipules interpetiolar, persistent, with a narrowly to widely triangular limb, 3–4 × 2–6 mm, and a terminal arista, 3–8 mm long, free or slightly fused intrapetiolarly, externally glabrous to hirsute, internally densely sericeous with thick whitish hairs and red colleters at the base. Leaves opposite, usually petiolate, petioles 4–18 mm, semiterete, adaxially slightly sulcate, sometimes slightly winged from the decurrent blade, glabrate to sparsely hirsute above, ± hirsute below; blade usually well developed, 19.5–29 × 8.5–11 cm wide (sometimes minute needle-like, less than 1 cm), often gradually acropetally larger, or decreasing just below the inflorescence, thinly papyraceous when dry, elliptic or sometimes narrowly obovate, at apex acuminate with tips to 25 mm long, at base narrowly cuneate, midrib impressed to level above, prominent below, secondary veins 11 to 14 pairs, brochidodromous, impressed to level above, prominulous to prominent below, tertiary venation indistinct, level to slightly prominulous above, level to prominulous below, adaxial surface matte or slightly glossy, glabrous except ± hirtellous midrib, abaxial surface sparsely hirtellous to hirsute on midrib and secondary veins. Male flowers in a terminal determinate thyrse, 10- to 40-flowered, to 11 cm high and 17 cm wide at base, peduncle to 18 mm, and pedicels 3–20 mm, branches of first and second orders dichasial, higher orders often monochasial, inflorescence branches hirsute, each flower and branch subtended by a needle-like, hirsute bract. Calyx tube minute, ca. 1 mm deep and 2 mm diam. with 7 to 10 semiterete, needle-like lobes, each 5–9 mm long, glabrous inside, hirsute outside; corolla salverform, 6-merous, white, not odorous, membranaceous, tube 19–23 mm long, sparsely hirsute outside, glabrous inside, lobes narrowly triangular, to 21 × ca. 2 mm, glabrous; stamens included; filaments less than 1 mm long, inserted 5–7 mm below top of corolla tube; anthers linear with an apical connective process, ca. 5 × 1 mm, included, dorsifixed with filament inserted 2 mm from base; pollen 4- to 5-colporate, foveolate; non-functional style 3-lobed, slender, ca. 17 mm, included, lobes ca. 2 mm long, slightly ridged on back, an annular disk surrounding the style basally. Female flowers solitary and terminal, subtended by stipules of the distal nodes, peduncle to 2 mm; calyx tube minute or obscured (hidden behind hairs), calyx lobes 8–9, needle-shaped, ca. 8–12 mm long, glabrous inside, hirsute outside; corolla salverform, 7-merous, cream-colored, membranaceous, tube 17 mm long, hirsute outside, glabrous inside, lobes linear, 21 × 3–4 mm, glabrous, style 4-lobed, included, 15 mm long, lobes ca. 4 mm long, ovary (young fruit), subspherical, 7–8 × 8–9 mm, densely hirsute; 3- or 4-locular with one axial placenta per locule, with 15 to 25 ovules per placenta. Fruits indehiscent, many-seeded, ± spherical, 2.5–4.5 × 2.5–5 cm, glabrous to sparsely hirsute, lenticellate, ferruginous, gray, brown to yellow; calyx lobes persistent in fruit, but mostly broken on herbarium material (young fruits with 15 mm long lobes), pericarp 5 mm thick; seeds angularly lenticular or flattened, ca. 2 × 10 × 12 mm, embedded in a fleshy placental pulp, exotesta cells smooth, elongate, 5 to 10 times longer than wide, with secondary thickenings in radial wall.

Distribution and habitat. *Stenosepala hirsuta* has been collected in primary and secondary lowland forests from 50 to 1000 m elevation in the Chocó province, the Cauca (Antioquia, Córdoba, Caldas) and Magdalena valleys (Bolívar and Santander) of northern Colombia, as well as the province of Darién in Panama.

Phenology. Flowering specimens have been collected in September and October with fruiting specimens from November to August. The only record of mature fruits is from October.

Paratypes. COLOMBIA. **Antioquia:** Mpio. Arboletas, vereda La Toyosa, 100 m, 30 Mar. 1983, *Bernal & Galeano 520* (COL); Peñas Blancas, 28 Apr. 1926, *Woronow & Juzenczuk 4579* (F 2 specimens); Mpio. Cáceres km 10–15 SE of Cáceres, sobre La troncal de la paz, 7°40′N, 75°20′W, 110–150 m, 5 Nov. 1987, *Callejas et al. 5360* (NY); Mpio. Caucasia, road to Nechí, ca. 14 km from Caucasia–Planeta Rica rd., hacienda Candelaria, 8°02′N, 75°11′W, 60 m, 11 Oct. 1987, *Brant & Escobar 1259* (K, NY); Mpio. Turbo Corr. Currulao, Currulao Nueva E-NE of Turbo, 11 km from Currulao 45 m, 3 Aug. 1987, *Callejas et al. 4981* (MO, NY); Mpio. Tarazá, Corr. El Doce, 201 km NE of Medellín, on road to Barroblanco, 300 m, 18 Aug. 1986, *Callejas et al. 2413* (HUA, MO, NY); Mpio. Cáceres, Corr. Jardín, Hacienda Catatumbo, 70 m, 21 Feb. 1988, *Fonnegra & Roldán 2358* (GB, NY); Mpio. Frontino, Murrí, carr. Nutivarra–La Blanquita, después del alto

←

of female flower and 4-lobed style. —H. Fruiting branch. —I. Single seed and cluster of seeds. A–E from holotype *Alzate et al. 560* (HUA); F, G from *Brant & Escobar 1259* (K, NY); H, I from *Betancur et al. 425* (NY). B–D and G, H have the same scale (see scale bar between B and C).

de Cuevas, 6°43′N, 76°19′W, 1000 m, 13 Apr. 1987, *Betancur et al. 425* (NY); Mpio. Caucasia (boundary with Dpto. Córdoba), road to Nechí 14.1 km from Caucasia–Planeta Rica road, Hacienda La Candelaria, 8°05′N, 75°10′W, 50 m, 24 Nov. 1986, *Zarucchi & Cárdenas 4246* (NY). **Bolívar:** 150 km N of Barrancabermeja, Mico Ahumado camp, 08°15′N, 74°4′W, 900 m, 20 Aug. 1966, *de Bruijn 1075* (COL, MO, NY); Mpio. Morales, Corr. Norosi, camino a Tiquisionuevo, 130–200 m, 9–14 Apr. 1985, *Cuadros 2114* (MO); San Pedro, 29 May 1949, *Romero Castañeda 1771* (F). **Chocó:** near Madurex logging Camp above Teresita and below the rapids of Río Truando, 7–8 Feb. 1967, *J. A. Duke 9927* (MO) **Caldas:** stream crossing 13 km N of La Dorada on road to San Miguel, 330 m, 7 Mar. 1977, *Gentry et al. 18203* (COL, MO). **Córdoba:** Mpio. Tierralta, carr. Tierralta–Frasquillo, alrededores de la quebrada Chibogadó, 80 m, 29 July 1986, *Bernal et al. 1205* (COL, MO). **Santander:** Magdalena valley, Campo Campote, 30 km E of Carare, 300 m, 29 Sep. 1977, *A. Gentry & E. Rentería 20047* (MO); 10 leguas al SE de Barrancabermeja, a 8 km, margen izquierda del río Opón, 200 m, 30 Aug. 1954, *Romero Castañeda 4775* (COL); Las Colonias (Opón, Cararere), 6 Nov. 1979, *Rentería et al. 1547* (COL, MO); Puente de Sogamoso, 0–500 m, 31 Oct. (1 Nov.) 1979, *Rentería et al.* 1988 (COL, MO); vicinity of Barrancabermeja, between Sogamoso and Colorado rivers, 100–500 m, 5 Oct. 1936, *Haught 2004* (F). PANAMA. **Darién:** clearing at confluence of Río Chucunaque and R. Canclones, 5 July 1962, *Duke 5120* (MO); 2–3 mi. SE of Pijibasal on Río Paraseneco, ca. 9–10 mi. S of El Real, *R. L. Hartman 12060* (MO); trail from Canglón–Yaviza rd. to Río Chucanaque, 7.7 mi. E of Canglón, 8°20′N, 77°50′W, 50 m, 6 Mar. 1982, *Knapp & Mallet 3968* (MO).

Acknowledgments. My thanks are in particular due to Fernando Alzate Guarín (HUA) who collected the type specimen after I sent him him a poor description of the new taxon. I thank Lennart Andersson, Roger Eriksson, Claes Gustafsson, Gunnar Harling, Erik Ljungstrand, David Lorence, and Elmar Robbrecht for providing useful comments on the manuscript. The excellent drawing was made by Bobbi Angel. I am grateful to the curators of COL, F, HUA, K, and NY for the loan of herbarium specimens. Financial support received from Kungliga Hvitfeldtska stipendieinrättningen and Helge Ax:son Johnsons stiftelse are gratefully acknowledged.

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Dahlia parvibracteata (Asteraceae, Coreopsideae), a New Species from Guerrero, Mexico

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ABSTRACT. *Dahlia parvibracteata* (Asteraceae, Coreopsideae), a new species from Guerrero, Mexico, is described and illustrated. It is distinguished by its numerous flowers on terminal or axillary stems, either borne singly on long peduncles or on short-branching naked stems held above the foliage, and by its narrowly spatulate to oblong-lanceolate outer involucral bracts. This species falls within the natural range for the genus, and is morphologically closest to *D. moorei*, although there are distinct differences.

RESUMEN. Se describe e ilustra *Dahlia parvibracteata* (Asteraceae, Coreopsideae), una especie nueva de Guerrero, México. Se distingue por sus flores numerosas dispuestas en tallos terminales o axilares, ya sea solitarios en pedúnculos largos o en tallos desnudos cortamente ramificados y sostenidos por encima del follaje, y por sus brácteas involucrales externas angostamente espatuladas a oblongo-lanceoladas. Esta especie se encuentra dentro del rango natural del género y es morfológicamente cercana a *D. moorei*, aunque existen diferencias marcadas.

While collecting material from wild populations of *Dahlia* to expand natural history information and for cytological and molecular analyses of the genus, we have discovered an undescribed species from northern Guerrero, Mexico. It was observed growing from soil trapped among volcanic rocks and rubble in sun, partial shade, and filtered light.

Dahlia parvibracteata Saar & P. D. Sørensen, sp. nov. TYPE: Mexico. Guerrero: approximately 12 km N of Tasco, along Mex 55, just N of intersection of Mex 95 to Cuernavaca, 1820 m, in zone of fan palm, *Buddleja*, *Acacia*, and *Quercus*, 15 Sep. 1995, *J. P. Hjerting, D. E. Saar & P. D. Sørensen 95–128* (holotype, MEXU; isotypes, C, DEK, F, IEB, MO, TEX). Figure 1.

Herba perennis 0.8–1.5 m alta. Folia pinnata vel bipinnata. Capitula numerosa 5–8 cm diam.; squamis exterioribus involucri reflexis sub anthesi, anguste spathulatis vel oblongis, 9–14 mm longis, 2–3 mm latis. Flores radii corollis ligulatis lavandulis. Chromosomatum numerus: $n = 16$.

Herbaceous perennial from tuberous rootstock, several erect stems, 0.8–1.5 m, generally taller with increasing sun exposure. Stems reddish but variable, short pubescent, internodes hollow with nodes imperfectly solid. Median leaves 17.5–28 cm long including petioles, bipinnate with stipels frequently at first rachis node (Fig. 1, lower left), becoming merely pinnate without stipels to simple at the base of the flowering portion; primary pinnae 7 to 9; blades strigose below, particularly along the midrib, margins serrate and ciliate. Flowers numerous on terminal or axillary stems, either borne singly on long peduncles or 1 to 7 on short-branching naked stems held above the foliage. Capitulum 5–8 cm diam., including rays; disc florets fertile, tubular, yellow; ray florets sterile, ligules 7 to 8 (9), light lavender with veins abaxially darkened. Inner involucral bracts 7 or 8, 9–16 × 4–7.5 mm. Outer involucral bracts 5 or 6, narrowly spatulate to oblong-lanceolate, 9–14 × 2–3 mm, reflexed at anthesis, projected from a flat and somewhat disk-like capitulum base. Flowering (1995) occurs August through September. Achenes black, 9.5–12 × 1.1–2.8 mm. Chromosome number: $n = 16$.

An additional population was observed and sampled 16 September 1995 (*Hjerting, Saar & Sørensen 95–131*), growing among thickets along a fencerow, approximately 0.4 km north of the type locality. A third population was located about 1 km south of the type locality, but its position high on a ledge prevented its collection.

The specific epithet, *parvibracteata*, draws attention to the small, narrow outer involucral bracts, which twist somewhat, begin to bend outward from the inner bracts, and elongate beyond the flower bud prior to its opening. The result is an almost spider-like appearance (Fig. 2). This new taxon is tentatively placed in section *Dahlia* according to the sectional key provided by Sørensen (1969: 322), by its herbaceous habit, solid petioles, and pinnules opposite on the rachilla. However, this

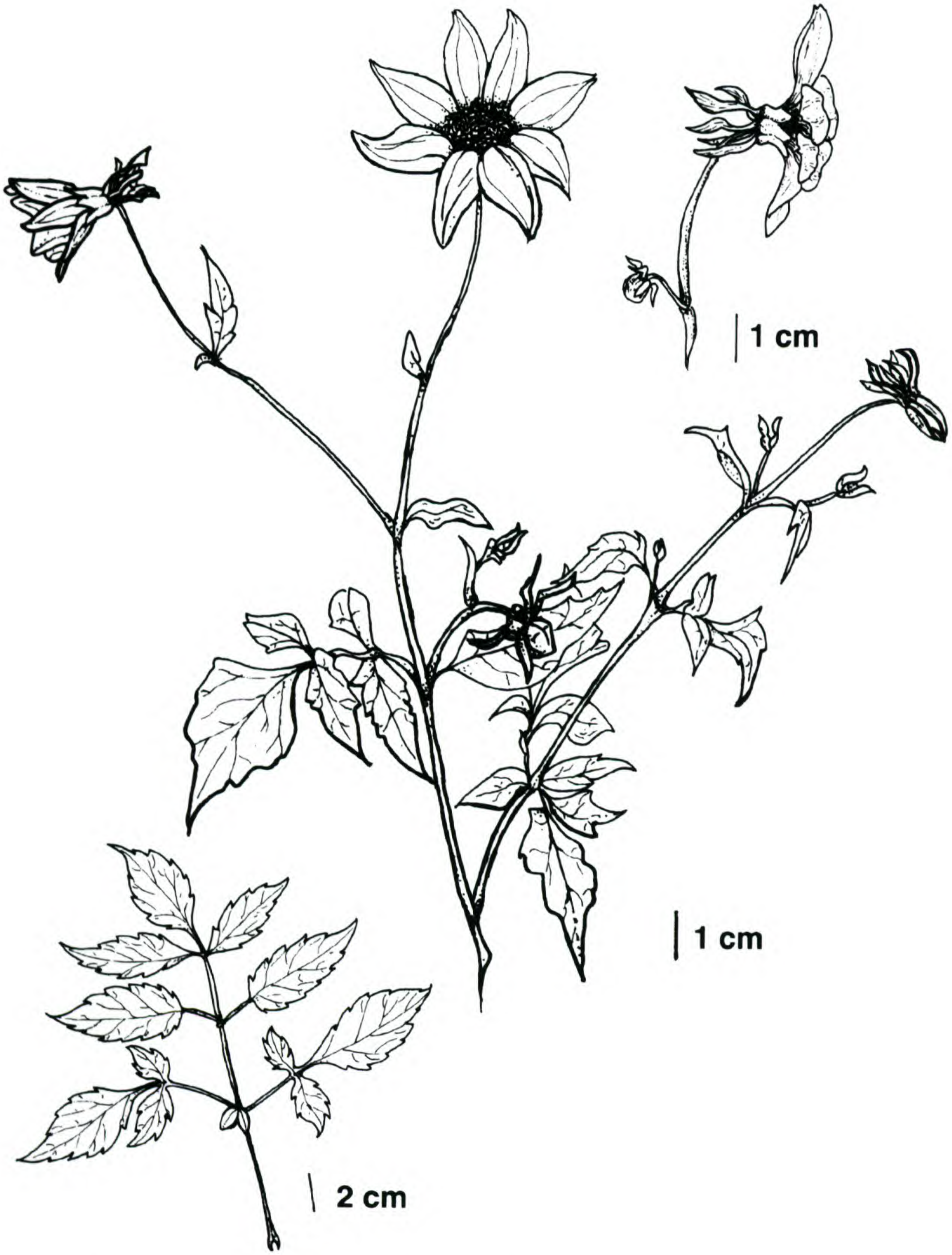

Figure 1. *Dahlia parvibracteata* Saar & P. D. Sørensen. —Center, habit. —Lower left, median leaf with stipels. —Top right, flower head and bracts. Drawn from type specimens.

Figure 2. Unopened flower heads with developing outer involucral bracts exhibit spider-like appearance. Photograph of cultivated plants grown from seed collected at type locality with characters resembling those observed in natural habitat.

placement should be considered provisional, pending molecular analyses of several species of *Dahlia* as part of a phylogenetic study currently in progress by the first author. Within section *Dahlia*, *D. parvibracteata* has outer involucral bracts reflexed at anthesis, compound median leaves, lavender ray florets, wingless petioles, and leaves and stems that are not densely pubescent or pilose (some trichomes present). The key to species can be amended to include *D. parvibracteata* by rewriting the first half of couplet "G" (Sørenson, 1969: 324) and making the additions as follows:

G. Outer involucral bracts 9–17 × 1.5–4 mm, flagelliform to narrowly spatulate to oblong-lanceolate, tips obtuse to long-attenuate.
+ Outer involucral bracts 10–17 mm in length, long-attenuate, broadest at or near the base. Achenes constricted slightly below the summit to form a black disc less than 1 mm wide and barely 0.4 mm high . . . . . *D. moorei*
+ Outer involucral bracts obtuse, 9–14 mm long, narrowly spatulate to oblong-lanceolate. Achenes without black disc . . *D. parvibracteata*

Although *D. parvibracteata* seems similar to *D. moorei* as suggested by the above key, there are other distinguishing characters as well. *Dahlia moorei* has purple style branches; *D. parvibracteata* has off-white branches. The apices of the terminal leaf segments are long acuminate on *D. moorei*; those of *D. parvibracteata* are acute to broadly acuminate. Stipels are fairly uncommon among plant species bearing compound leaves, but they occur frequently throughout this genus, including both of these species. It should also be noted that *D. moorei* is known only from the type specimens, collected in Barranca de San Vicente, northwestern Hidalgo, Mexico, 1949 (Sherff, 1951).

The observed populations of *D. parvibracteata* fall within the natural distribution of the genus and are sympatric with the wide-ranging *D. coccinea*, which is distinguished by its ray florets that may be yellow, orange, red, or blackish scarlet (never lavender). Altogether, with the publication of this taxon, there are 30 published species of *Dahlia*, not including the hybrid cultivated forms, often referred to as *D. variabilis*.

The chromosome count of $n = 16$ was based on the pollen mother cells of cultivated plants grown from seeds collected at the type locality. This count is the same as roughly half of the named species in the genus. It is considered a diploid among extant species and a tetraploid or "ancient polyploid" when based on $x = 8$ for extinct ancestral stocks (Lawrence & Scott-Moncrieff, 1935).

Acknowledgments. We thank Andrew M. Saar for preparing the illustration and Carmen Ulloa Ulloa for translating the abstract into Spanish. We also thank Jens Peter Hjerting who accompanied us in Mexico and whose fluency with the Spanish language facilitated our field research. Fieldwork was supported, in part, by the Northern Illinois University Faculty Development Fund to PDS and by the Department of Biological Sciences.

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Microsorum whiteheadii (Polypodiaceae), an Attractive New Species from Sumatra

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ABSTRACT. We describe and illustrate *Microsorum whiteheadii* (Polypodiaceae), endemic to limestone outcrops in Sumatra. It appears related to the widespread and polymorphic *M. punctatum* (L.) Copeland but differs from that species by the shorter-creeping rhizomes, more succulent, thicker, very dark green, oblanceolate blades, prominent hydathodes adaxially, and less visible venation.

Reggie Whitehead, a fern enthusiast and grower in the Miami area, has drawn our attention to a remarkable new *Microsorum* from Sumatra, growing epipetrically on limestone cliffs. In the recent treatment of this genus for *Flora Malesiana* (Bosman et al., 1998), and also in Bosman's (1991) previous monograph of *Microsorum*, *M. whiteheadii* would appear to key to *M. punctatum* (L.) Copeland, but we believe *M. whiteheadii* is quite dramatically different in several characters, discussed below. This attractive new species is now being successfully grown and propagated (from spores) by Mr. Whitehead in the Miami area and by John Banta, in Alva, Florida (near Ft. Myers), and we honor Mr. Whitehead's efforts by naming this fern for him. Both growers were led to the same area by Tang Fook Leong, on an expedition to relocate *Amorphophallus hirsutus* Teijsmann & Binnendijk (Araceae).

Microsorum whiteheadii A. R. Smith & Hoshizaki, sp. nov. TYPE: Sumatra. Western Sumatra, Prov. Paya Khumbu, Koto District, 30 km from Bukit Tinggi, Tanjung Gadang Rumah (near Paya Khumbu), 900 m, 2 July 1997, *Reggie Whitehead s.n.* (holotype, UC; isotypes, BO, L, MO, US). Figure 1.

Differt a *M. punctato* rhizomatibus breviter repentibus internodiis 2–5(–7) mm longis, laminis succulentioribus crassioribus oblanceolatis vel spathulatis abrupte reductioribus proximaliter, prominentioribus hydathodis adaxialiter, venis lateralibus vix visibilibus in statu vivo, venis areolatis non visibilis.

Rhizomes terete, in living material medium green (not glaucous) below the scales, ca. 5–10 mm thick, short-creeping, internodes 2–5(–7) mm long, roots densely set and forming a thick mat; vascular strands numerous, lacking sclerified sheaths but with numerous sclerenchyma strands (> 100) scattered uniformly throughout the cortex; rhizome scales brownish, lacking a lighter colored or hyaline margin, clathrate, pseudopeltate, appearing peltate by virtue of overlapping basal auricles, moderately dense, ovate with an attenuate tip, 3–5 × 1.5–3 mm, the bases appressed, the tips often squarrose, margins erose-denticulate to coarsely dentate or with scattered 1- to 3-celled glandular hairs, otherwise glabrous, the basal cells ± isodiametric, the cells at the attentuate tip rectangular, up to 2–3 times longer than wide and often darker- and thicker-walled than walls of basal cells. *Fronds* monomorphic, sessile, thick-coriaceous and somewhat succulent (like India rubber plant, *Ficus elastica* Roxburgh). *Stipes* absent or less than 1 cm long, up to ca. 5 mm diam., with ca. (3–)4–6(–9) round vascular bundles arranged in a cup in cross section (two adaxial bundles much larger than the others), glabrescent or with a few linear-lanceolate clathrate scales at the very base; stipes of young fronds beset with evanescent scales. *Blades* simple, broadly to less often narrowly oblanceolate, mostly 20–65(–78) × 7–9(–13) cm, margins entire, base abruptly narrowed and with a narrow laminar wing nearly or quite to the rhizome, the wing ca. 1 cm or less for 10(–25) cm, blade tips rounded to subacute or acuminate; abaxial surfaces glabrous or glabrescent at maturity, when young with a scattering of minute 1- to 3-celled uniseriate glandular hairs; blades of newly formed croziers covered with glandular hairs like those of stipes. *Venation* (of large and fully developed fertile and sterile fronds) type 4 (terminology of Nooteboom, 1997: 262–263), with the first connecting veins (between main lat-

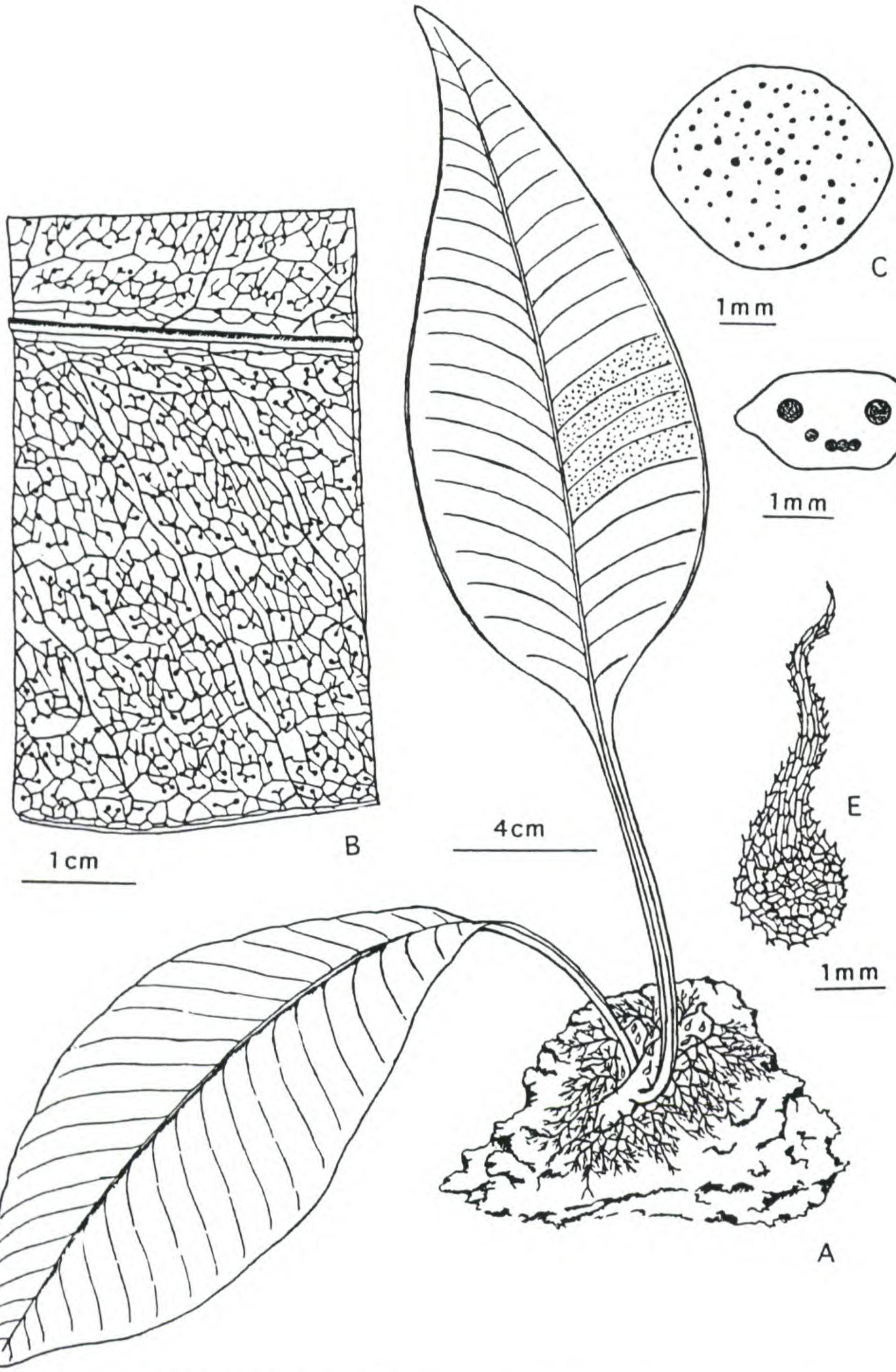

Figure 1. *Microsorum whiteheadii* A. R. Smith & Hoshizaki. (A, C–E drawn from material in cultivation, garden of Reggie Whitehead; B from holotype). —A. Habit. —B. Venation. —C. Rhizome cross section, showing numerous, scattered sclerenchyma bundles. —D. Stipe cross section, with two large adaxial and several smaller abaxial vascular bundles. —E. Rhizome scale.

eral veins) forming one row of small primary costal areoles parallel to costa (midrib), then with up to ca. 6 larger areoles in a row between two main lateral veins (Fig. 1B), lacking a prominent veinlet (tertiary vein) parallel to the main lateral veins; smaller fronds with venation type 1, with connecting veins forming a row of about equal-sized areoles between two adjacent veins (lacking a narrow costal areole); veins immersed or vague, main lateral veins and connecting veins faintly visible on both sides of blades as whitish lines, main lateral veins up to ca. 20 mm apart at their origin, connecting veins mostly 6–10 mm apart, ± straight or slightly zigzagged, irregularly branched near margin, catadromous, smaller veins completely immersed and not visible or extremely vague, variously anastomosing; free veinlets mostly simple, occasionally 1-forked; veins ending in prominent hydathodes adaxially. *Sori* separate, round, occasionally two sori joined (and thus the "fused" sori are oblong or slightly elongate), superficial, ca. 1.0–1.5(–2.5) mm diam. at maturity, seemingly ± irregularly scattered on the smallest veinlets or appearing in irregular rows, in fully developed fronds roughly in 6 to 10 such irregular rows between and parallel to main lateral veins, each row containing 2 to 4 sori in a file within each primary areole (as defined by the connecting veins, which are ± perpendicular to main lateral veins), thus roughly 12 to 40 sori per primary areole; sori exindusiate, ca. 10 to 15 (to 22) per sq. cm, over the whole surface of the lamina except on the abruptly narrowed blade base and the extreme tip, as well as in the costal areoles; sporangial capsules nearly globose, paraphyses lacking.

Habitat. Growing on limestone outcrops, at a site being mined for marble and adjacent to a marble processing plant. Mining is likely to have destroyed the species at this particular site. An aroid at this same site, *Amorphophallus hirsutus*, may also have been lost; it had been known only from this location, and no one has seen it since the early 1900s. Nearby sites, where other marble outcrops occurred, had previously been reduced to rubble. Specimens of *Microsorum whiteheadii* were sought from these areas, and the adjacent bushy area surrounding the outcroppings, without success. Specimens were not found on trees in the area (Whitehead, in litt.).

Microsorum whiteheadii appears to be mostly closely related to *M. punctatum*, widespread in the paleotropics and subtropics throughout tropical Africa, Madagascar and Mauritius, southern India, southeast Asia (including southern China), Malesia, northeastern Australia, New Caledonia, and western Polynesia (Bosman, 1991). In the recent treatment of this genus for *Flora Malesiana* (Bosman et al., 1998), and also in Bosman's earlier monograph of *Microsorum* (Bosman, 1991), *M. whiteheadii* will key to *M. punctatum*, but we believe *M. whiteheadii* is dramatically different in several important characters. Bosman (1991) and Nooteboom (1997) listed 21 heterotypic synonyms of *M. punctatum*, but only one of these, *Polypodium antrophyoides* Alderwerelt, has a Sumatran type (Palembang, *Forbes 3119*, BM not seen); from its original description and the area from which it was collected, we believe that it cannot be conspecific with *M. whiteheadii*.

From *Microsorum punctatum*, which is similar in having undivided blades, superficial, irregularly scattered sori, and very complex, reticulate venation with more or less equally sized areoles, our new species differs in having generally shorter creeping rhizomes (internodes usually more than 1 cm and often more than 2 cm in *M. punctatum*), thicker, more coriaceous yet subsucculent blades (both living and pressed specimens), shorter and more abruptly tapering blade bases and more oblanceolate blades that are generally broader distally than in *M. punctatum* (proportional to the blade base), more decidedly immersed veins, and somewhat larger and fewer sori per sq. cm. Rhizomes of *M. punctatum* are described as generally drying glaucous or whitish, and we confirm this in herbarium specimens; we have not seen this coloration in dried rhizomes of *M. whiteheadii*. The venation of *M. whiteheadii* is somewhat similar to that illustrated for *M. punctatum* by Nooteboom (1997, pl. 13, figs. 43, 44), but even more complex, with a greater number of the smallest areoles contained within the primary areoles. We did not find paraphyses in the sori of *M. whiteheadii*, even in the youngest fronds or fluid-preserved material of young sori; Bosman et al. (1998) described sori of *M. punctatum* as paraphysate, having simple uniseriate hairs with glandular tips in the sori, but we are unable to confirm this in living and herbarium material available to us. As seen in living material, the midrib in *M. whiteheadii*, as viewed adaxially and above the base, is not or only slightly raised, and if raised it is gently rounded in cross section as opposed to the condition in *M. punctatum*, where the midrib is sharply raised and bluntly keeled in cross section. Hydathodes of living plants of *M. whiteheadii* may be seen with the naked eye but are difficult to see in *M. punctatum*, even with a 10 power hand lens.

Microsorum punctatum is quite common and variable, both in nature and in cultivation, and so is familiar to many fern growers (Hoshizaki, 1982, as

Polypodium polycarpon Cavanilles ex Swartz, a synonym). *Microsorum whiteheadii* appears to us to be an even more attractive plant, with its thicker, dark glossy-green fronds. It has so far proven relatively easy to grow from rhizomes or spores, on soil, pea-rock mixtures, or sphagnum moss, either terrestrially or epiphytically in hanging baskets. The isotypes have been propagated and grown from plants originally gathered at this locality by Mr. Whitehead. Locality information was provided by Tang Fook Leong.

Microsorum is sometimes recognized in a narrow sense, to include those species with numerous scattered, superficial (not deeply sunken) small sori (e.g., by Hennipman et al., 1990; Bosman, 1991). Others now combine *Phymatosorus* with *Microsorum* (e.g., Nooteboom, 1997; Bosman et al., 1998). Regardless of the circumscription of *Microsorum*, *M. whiteheadii* is clearly a member of this genus in the narrow sense, should one wish to restrict it.

Paratype. SUMATRA. **Western Sumatra, Prov. Paya Khumbu:** 30 km from Bukit Tinggi, 900 m, ca. Dec. 1995, *Banta s.n.* (UC, a fertile frond from B. J. Hoshizaki via Whitehead via Banta; MO, with rhizome, obtained directly from Whitehead and also from Banta's original plant). This locality is the same as that of the type.

Acknowledgments. We thank Reggie Whitehead and John Banta, fern growers in the Miami area, for sharing specimens of *M. whiteheadii* with us and for providing some of the extreme measurements of more luxuriant fronds in plants under their care. We also thank Debbie Lamb for the illustration.

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A New *Setaria* (Gramineae: Paniceae) from Argentina

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ABSTRACT. *Setaria inopinata* Toolin, sp. nov., is described and illustrated, and a key is provided to separate it from similar species in the genus. Apparently, this caespitose perennial, which resembles *S. tenax*, occurs only in northwestern Argentina.

During the study of specimens of South American *Setaria* as part of a project to enumerate those species that occur in both North and South America, some specimens appeared to share a suite of distinctive characters that did not seem to fit any previously described species. Comparisons revealed that these specimens were easily separated from other *Setaria* taxa, and I here propose them to be elements of a new species.

Setaria inopinata Toolin, sp. nov. TYPE: Argentina. Juyjuy: La Mendieta, matas laxas, a lunda a orille del ferrocarill, 7 Feb. 1943, *L. R. Parodi 14573* (holotype, US 1865698, ex Herbario de L. R. Parodi; isotype(s), possibly at BAA not seen). Figures 1, 2.

Haec species *S. tenici* similis, sed ab ea spiculis ellipticioribus, lemmate supero apice marronino, rugoso non nitente, inflorescentiae aristis antrorse tantum hamatis, palea infera plus minusive pyriformi basi coriacea, quam palea supera angustiore brevioreque, distinguitur.

Perennial, caespitose, from a knotty base. Culms erect or geniculate, to ca. 1.2 m tall, scaberulous, hirtellous below the nodes, the nodes pubescent or glabrate with age. Sheaths rounded, glabrous or occasionally with pustulate-based hairs, the upper margins ciliate; at least some collars pubescent with stiff hairs on each side. Ligule of stiff hairs ca. 2–3 mm long. Blades flat, to ca. 30 cm long and 0.6–2.5 cm wide, tapering to the base or somewhat cordate, scabrous, occasionally pubescent, the apex setose-involute, usually spirally twisted when dried. Panicles less than 15 to ca. 30 cm long, ca. 1–2.5 cm wide (excluding awns), somewhat open, the branches ascending, the lower to 3 cm long; or panicles more contracted, the branches all ca. 1 cm long; axis and branches minutely scabrous-hirsute and densely pilose or hirsute. Pedicels short, scabrous-hirsute, each with a single antrorsely barbed awn to 2.5 cm long. Spikelets 2.0–2.3 × 1.7–2.0 mm, and 1.6–1.9 mm thick, glabrous, strongly gibbous, broadly ovate-elliptic; lower glume ca. ⅓ as long as the spikelet, not apiculate or scarcely so, 3–5-nerved; upper glume ½(⅔) the spikelet length, broad and rounded, 5–7-nerved, at most slightly apiculate; lemma of lower floret short-apiculate, 5–7-nerved, equaling the spikelet, often only the middle and lateral nerves fully developed, thus appearing 3-nerved; palea of lower floret to ¾ the length of the upper palea, usually pyriform, the base broad, commonly coriaceous, brownish, narrowed to a hyaline upper part, with margins occasionally slightly thickened; the upper part may be only somewhat narrower than the lower (as in the type specimen), but the two parts apparently generally of different texture. Lemma of upper (fertile) floret 1.9–2.2 × 1.6–1.9 mm, and 1.5–1.8 mm thick, strongly gibbous, broadly ovate-elliptic, light to dark brown, the apex often becoming suffused with maroon at maturity, finely and evenly rugose, the cross-wrinkles slighty less pronounced toward the shortly apiculate, downturned apex; inrolled margins of the lemma (grasping the palea) are rather broad and somewhat flattened. Stamens 3, yellow. Stigmas 2, dark red.

The peculiar palea of the lower floret of *Setaria inopinata* is almost unique in the genus (at least among American species). A similar palea has been described for *S. pflanzii* Pensiero from northern Argentina and southern Bolivia (Pensiero, 1999), which is otherwise quite unlike *S. inopinata*. In *S. pflanzii*, e.g., the rachis is glabrous, the spikelets are 3 mm or more long, the upper glume is equal or subequal to the fertile lemma and 9–10-nerved, and the fertile lemma is nearly smooth and is shiny. I am not aware of other American species possessing sterile paleas with such marked textural diffences between the basal and upper portions. The question arises as to whether the peculiar paleas of these two species result from pathogenic infection, but at least as far as fungal activity is involved, tests were negative for *S. inopinata* (R. L. Gilbertson, pers. comm. 1997).

Setaria inopinata has gone undescribed even though specimens have been examined by such competent agrostologists as L. Parodi, S. Venturi, T. Stuckert, A. Hitchcock, A. Chase, and J. Pensiero. Nearly all the specimens I have seen have labels

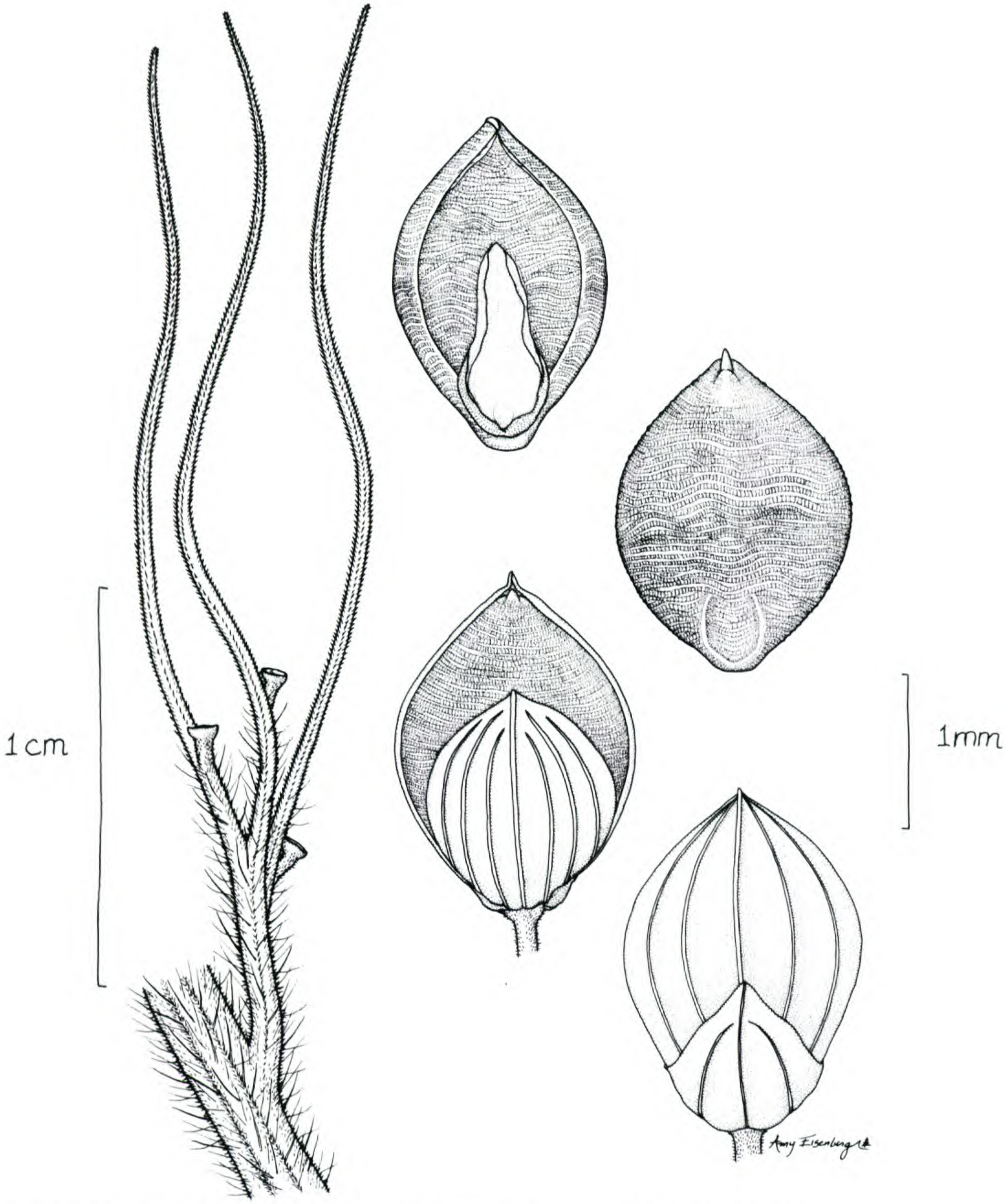

Figure 1. Details of the spikelets and florets of the type of *S. inopinata* Toolin (*Parodi 14573*).

originally bearing only the generic name. Various species names were often added by later workers. It seems astonishing that this distinctive taxon has escaped recognition for so long, and thus its specific name, which means "surprising." Part of the foregoing lack of recognition appears to have been due in some part to the confusion of various species among earlier South American agrostologists (see Toolin & Reeder, 2000). More recently, *S. inopinata* has had the name of a different species misapplied to it.

All specimens of *Setaria inopinata* I have seen were collected in northwestern Argentina. Flowering occurs from November to March.

As in many other members of subgenus *Setaria* Rominger (Rominger, 1962), *S. inopinata* can exhibit considerable morphological variation in vegetative parts and in panicle size and shape. Such

Figure 2. Photograph of the type specimen of *S. inopinata* (*Parodi 14573*).

variations are probably due to environmental conditions during growth and reproduction. In habit and gross morphology, *S. inopinata* most closely resembles *S. tenax* (Richard) Roemer & Schultes, and to a lesser extent, *S. scabrifolia* (Nees) Kunth, and robust forms of *S. macrostachya* HBK, but differs in significant details. *Setaria pflanzii* is rather more distinct from the others. The following key will serve to separate the five species.

1a. Lemma of upper floret entirely shiny and obscurely rugose; panicle axis glabrous; upper glume equal or subequal to the upper lemma; spikelets 2.8–3 mm long . . . . . *S. pflanzii*
1b. Lemma of upper floret entirely rugose and not shiny, or only the apex smooth and shiny; panicle axis ± pubescent; upper glume ¾ or less as long as the upper lemma; spikelets 2.4 mm long or less.
  2a. Apex of upper floret lemma not rugose, more or less smooth, shiny; palea of lower floret as broad and long as upper floret palea, with widely infolded margins.
    3a. Upper glume ca. ½ the length of upper lemma; awns with both antrorse and retrorse barbs . . . . . *S. tenax*
    3b. Upper glume ca. ¾ the length of the upper floret lemma; awns with antrorse barbs only . . . . . *S. scabrifolia*
  2b. Upper lemma entirely rugose, apex never smooth and shiny; lower palea narrower than the upper floret palea, the margins not widely infolded.
    4a. Collars bearing stiff hairs ca. 1 mm long, becoming glabrate; panicle axis densely hirsute or somewhat pilose, the hairs ca. 1 mm long; upper glume ca. ¾ the length of the upper floret lemma; lemma tan to brown, upper part usually suffused with maroon at maturity; palea of lower floret ± pyriform and coriaceous at base . . . . . *S. inopinata*
    4b. Collars glabrate or with minute, curly hairs; panicle axis not densely hairy, bearing scattered villous white hairs (2)3(4) mm long; upper glume ⅔ the length of the upper lemma; lemma greenish white to tan, apex never suffused with maroon; palea of lower floret lanceolate-oblong, never coriaceous at base . . . . . *S. macrostachya*

Specimens at NY and US of what I propose as *Setaria inopinata* were annotated as *S. macrostachya* by J. Pensiero. I do not know the basis for Pensiero's annotations to *S. macrostachya*. It appears from his published descriptions (1988, 1999) that he has been consistently misapplying the name *S. macrostachya* HBK to the species herein described as new. In addition to the characters in the key above, *S. macrostachya* differs in having fertile lemmas consistently narrower and thinner relative to length. In *S. macrostachya*, the averaged width; thickness; length values (for over 100 specimens) are 1.5; 1.5; 2.1 mm, while in *S. inopinata* averaged values (for ca. 35 specimens) are 1.6; 1.7; 2.1 mm, respectively. Although Pensiero (1999) gave the width of "*S. macrostachya*" (*S. inopinata*) lemmas as "1.2–2 mm lat.," I have found only one or two lemmas as narrow as 1.3 mm, and very few as narrow as 1.4 mm wide, about 90% being 1.5–1.8 mm. These differences may be attributed to the occasional extreme in Pensiero's larger sample, and need not be critical. Pensiero (1988: 374) indicated that he had seen "fragmentos del holotipo" of *S. macrostachya* at BAA; if those fragments consisted solely of spikelets, then a misconception might have arisen some time after he saw those fragments, since the spikelets of the two species are roughly similar at first glance, both being notably gibbous. I emphatically point out that Pensiero's description is very different than Rominger's description of *S. macrostachya* HBK, in the standard work on North American *Setaria* (Rominger, 1962), which Pensiero has cited (1988, 1999). I will be providing specimens of *S. macrostachya* HBK (that I have compared to type fragments (US) of that species) to various South American herbaria so that a clear concept of that species may be gained by South American agrostologists.

Paratypes. ARGENTINA. **Chaco:** Villa Angela, Feb. 1940, *Boffa s.n.*(NY); Las Buenas, entre grannas[?] en los cercos, 24 Feb. 1930, *Venturi 10174* (GH, NY, US). **Formosa:** Laishi, Mar. 1918, *Jörgensen 2414* (GH). **Juyjuy:** San Pedro de Juyjuy, 12 Apr. 1945, *O'Donnell 3053* (NY); Dept. Capital, Arroyo Palo Mercado, 23 Jan. 1976, *Cabrera et al. 27505* (US); La Mendieta, 11 July 1945, *Parodi 14578* (US); Dept. Capital, Rio Lali, 12 Dec. 1923, *Venturi 2259* (US). **Salta:** Dept. Capital, La Merced, 26 Feb. 1949, *Legname 474* (US); Dept. Candelaria, Agua Caliente, 26 Feb. 1925, *Venturi 3696* (US); Dept. Salta, Rosario de la Frontera, 29 Jan. 1935, *Carbone 767* (GH); Dept. Cerillos, Cerillos, 2 Feb. [19]41, *Meyer 3583* (GH); Ledesma, 27 Apr. 1927, 30 Enero 1916, *Spegazzini 1088* (US); Cerro San Bernardino, 6 Feb. 1940, *Parodi 13497, 13499, 13505* (US). **Tucumán:** Dept. Leales, Las Encrucijades, 24 Feb. 1941, *Ousset 56* (NY), *53* (GH); Dept. Burrujacú, Cerro de Campo, Mar. 1918, *Bailetti 309* (GH); Dept. Leales, La Rioja, 4 Feb. 1940, *Castellanos s.n.* (GH); Dept. Leales, Chanar Pozo, Nov. 1919, *Venturi 626* (GH, K, US); Tapia, Hab. rozadas, 29 Dec. 1911, *Rodrigues 253* (US); Dept. Capital, Capital, 15 Mar. 1910, *Lillo 10081* (US); Dept. Trancas, Tapia, 30 Dec. 1923, *Venturi 2341A, 2343* (US); Dept. Cruz Alta, Estación Araoz, 6 Jan. 1926, *Schreiter 4496* (US).

Acknowledgments. I thank the curators and staffs of ARIZ, GH, K, NY, and US for facilitating the loan of specimens and/or providing work space. Unfortunately, the South American *Setaria* specimens housed at MO were on loan and not available at the time of this study. J. R. Reeder reviewed an earlier draft of this manuscript. Amy Eisenberg

made the drawing in Figure 1, and John Amato provided the photo in Figure 2.

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Volume 10, Number 1, pp. 1–94 of NOVON was published on 17 April 2000.
Volume 10, Number 2, pp. 95–186 of NOVON was published on 30 June 2000.
Volume 10, Number 3, pp. 187–298 of NOVON was published on 12 September 2000.
Volume 10, Number 4, pp. 299–420 of NOVON was published on 14 December 2000.